GEOLOGICAL SURVEY OF ALABAMA

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ECOSYSTEMS INVESTIGATIONS PROGRAM

WATERSHED ASSESSMENT OF THE BIG CANOE CREEK SYSTEM FOR RECOVERY AND RESTORATION OF IMPERILED AQUATIC SPECIES

Bulletin 185

by

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May __, 2016

The Honorable Robert Bentley
Governor of Alabama
Montgomery, Alabama

Dear Governor Bentley:

It is with pleasure that I make available to you this report entitled *Watershed Assessment of the Big Canoe Creek System for Recovery and Restoration of Imperiled Aquatic Species*, by E. Anne Wynn, Patrick E. O'Neil, Stuart W. McGregor, Jeffrey R. Powell, and Michael Gangloff, which has been published as Bulletin 185 by the Geological Survey of Alabama.

This bulletin is the latest in a series of reports on Strategic Habitat Units (SHUs) for Aquatic Species of Conservation Concern in Alabama and presents aquatic biological and water information that can be used to monitor and restore streams in the Big Canoe watershed and recommendations for improving water quality, water flows, and overall water resource quality.

Recent events such as the droughts of 2000 and 2007 and the ongoing water sharing issues among Alabama, Georgia, and Florida are examples of water resource problems that have become front-page water management issues for Alabama. With a growing economy, the ever expanding population in the Southeast, and the uncertainty surrounding the availability and predictability of water supply and quality, expanded water planning and management activities are needed for the state to be prosperous and productive. The Alabama Water Agencies Working Group (AWAWG) has been actively engaged in creating a sustainable plan for the management of the state's water resources. Successful water resource management requires a bottom-up approach that is inclusive of all water users—from agricultural, commercial, and industrial users to municipalities and rural water associations.

In support of this cooperative partnership approach, this bulletin provides an action plan for the prioritization of habitat restoration and species recovery activities to be implemented through educational initiatives that will provide science-based information about the watershed and water resources and their collective importance to the economic and ecological health of the region.

Respectfully,

Berry H. (Nick) Tew, Jr.
State Geologist

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WATERSHED ASSESSMENT OF THE BIG CANOE CREEK SYSTEM FOR RECOVERY AND RESTORATION OF IMPERILED AQUATIC SPECIES

by
Elizabeth Anne Wynn, Patrick E. O'Neil, Stuart W. McGregor,
Jeffrey R. Powell, and Michael Gangloff

ABSTRACT

The Big Canoe Creek watershed in east-central Alabama has been designated a strategic habitat unit (SHU) for the restoration and recovery of imperiled aquatic species in Alabama for the following reasons:

- the historic occurrence in Alabama of three mussel species now extirpated from the state, the Upland Combshell (*Epioblasma metastriata*), the Georgia Pigtoe (*Pleurobema hanleyianum*) and the Southern Acornshell (*E. othcaloogensis*),
- the presence of several mussel species listed as federally endangered or threatened, including the Finelined Pocketbook (*Hamiota altilis*, Threatened), the Southern Pigtoe (*Pleurobema georgianum*, Endangered), the Rayed Kidneyshell (*Ptychobranchus foremanianus*, Endangered), and the Southern Clubshell (*Pleurobema decisum*, Endangered),
- the unique occurrence of a mussel species known only from Big Canoe Creek and considered a species of highest conservation concern in Alabama (*Pleurobema athearni*—the Canoe Creek Clubshell), and
- the presence of the Trispot Darter (*Etheostoma trisella*), a fish species of high conservation concern in Alabama that was absent from state collection records for over 50 years.

Data on freshwater biology, habitat, and water quality conditions have been compiled and are presented in this report. Recent mussel surveys have confirmed the presence, in good abundance, of some listed species while other species were found only in marginal numbers. Biological condition in the watershed is generally good, particularly in upper Big Canoe Creek and Little Canoe Creek (west), but poor to fair conditions were noted in the lower main channel of Big Canoe Creek and Gulf Creek. Habitat surveys identified several sites in poor to marginal condition while many other sites were rated suboptimal to optimal. Sedimentation risk surveys of road-stream crossings found 15 crossings at high risk for sedimentation and 20 sites with significant fish barriers in the form of blocked and perched culverts that prevent movement of imperiled aquatic fauna. Upper Big Canoe Creek from U.S. Hwy. 11 and Little Canoe Creek (west) from its mouth upstream to Springville are priority subwatersheds for implementing habitat restoration projects and conducting future monitoring. Development of a watershed management plan is necessary for the management and recovery of populations of imperiled species. A Big Canoe Creek action plan is presented in this report as a framework for the prioritization of habitat restoration and species recovery efforts. Recommendations for improving aquatic habitat,

water quality, water flows, and overall water resource quality are also described in the action plan.

INTRODUCTION

Protection and conservation of water resources is becoming a local, regional, and national priority in the face of water supply shortages due to over consumption, drought, the uncertainties of climate change, and the need to provide adequate water to meet habitat requirements for fish and wildlife. Alabama's future water needs for public supplies, economic activity, and energy production are expected to increase. Sustainable water use and water production, as well as a process for protecting and conserving fish and wildlife and the natural systems that yield water, will be the keys to satisfying these needs. Recent events, including the droughts of 2000 and 2007, and ongoing water sharing issues among Alabama, Georgia, and Florida, are examples of water- resource problems that have become front-page water management issues for Alabama as well as the region. With a growing economy, the ever expanding population in the Southeast, and the uncertainty surrounding the availability and predictability of water resource supply and quality, expanded water planning and management activities are needed for the region to remain prosperous and productive.

The Southeast has a high number of rare aquatic species, many of which are protected under state conservation regulations and the federal Endangered Species Act (ESA). Several of these species are restricted in distribution, occur in small disjunct populations, and are threatened by pollution and habitat degradation (Mirarchi, 2004). The mussel and fish faunas of the Mobile River Basin have high degrees of endemism and diversity, which can be attributed to the large size of the basin, numerous aquatic habitat types due to the varied landscapes found in the basin, geographic barriers such as the Fall Line, and the proximity of the basin to adjacent drainages with diverse faunas (Williams, 1982).

The mussel, snail, fish, and crayfish faunas of the Southeast have been substantially diminished over the past 100 years directly because of physical changes and loss of habitat, and indirectly because these changes interfere with unique life history needs and requirements. Many habitats in the Southeast, particularly large rivers, have changed due to impoundment, channel modification, eutrophication, and increased erosion and sedimentation (Hartfield, 1994; Mott and Hartfield, 1994). Habitat disruption and fragmentation have resulted in a decline in freshwater populations to the point that many species are now federally listed.

Currently, 17 species of mussels in the Mobile River Basin are recognized as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS). For recovery and restoration of species listed under the ESA to be successful, the following criteria must be met:

- Populations must increase.
- Populations must be restored in areas where they formerly occurred.
- Populations must be stable and reproducing.
- Habitat must be restored to support species.
- Threats causing the decline must be reduced or eliminated.

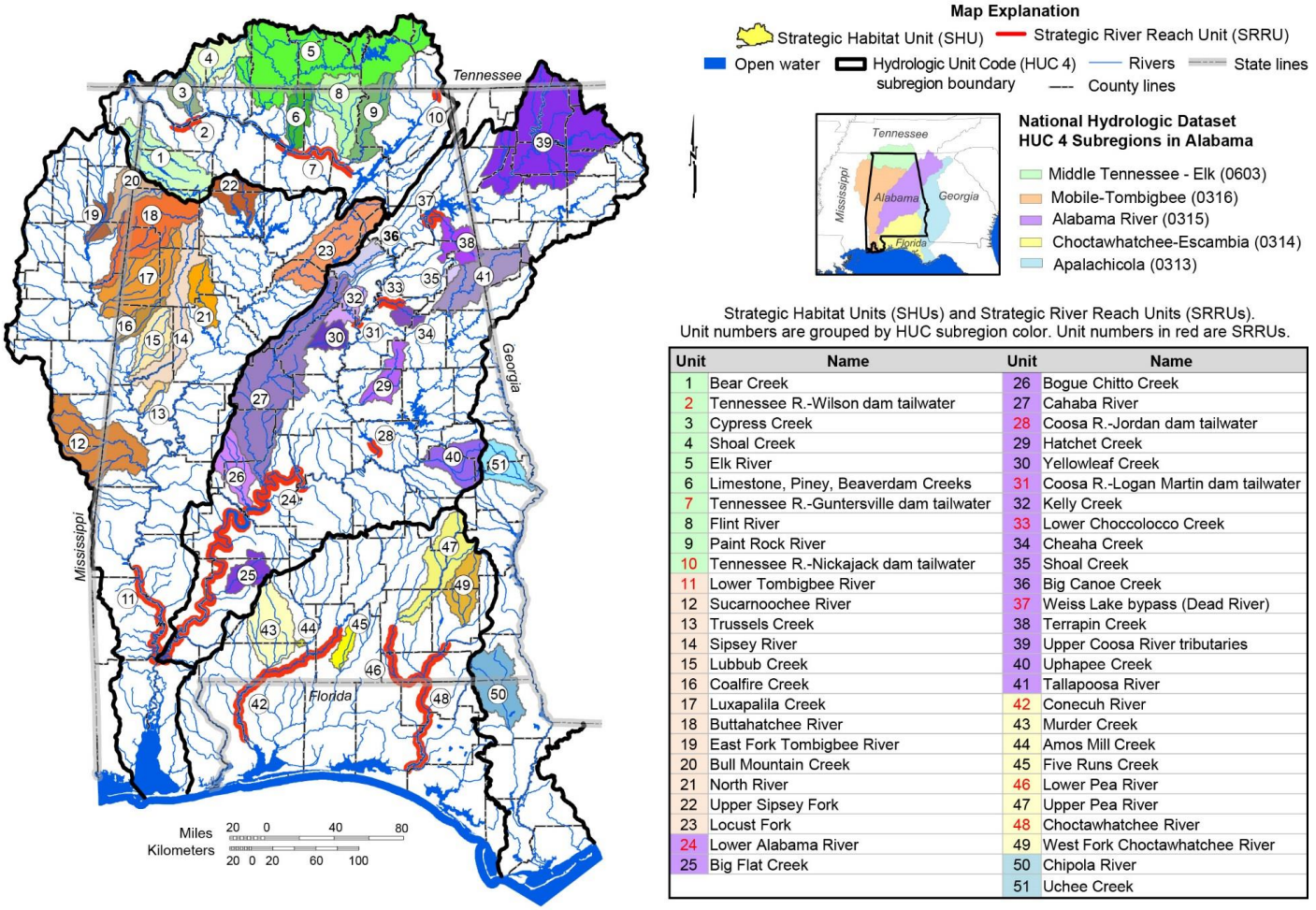
The USFWS, Alabama Department of Conservation and Natural Resources (ADCNR), and the Geological Survey of Alabama (GSA) have outlined 51 Strategic Habitat Units (SHUs) and Strategic River Reach Units (SRRUs) where conservation activities in Alabama are critical for the management, recovery, and restoration of populations of rare fishes, mussels, snails, and crayfishes (Wynn and others, 2012). The purpose of designating SHUs and SRRUs is to facilitate and coordinate watershed management and restoration efforts as well as focus funding to address habitat and water quality issues. Figure 1 depicts the locations of currently designated SHUs and SRRUs in Alabama and neighboring states. All SHUs and SRRUs currently support one or multiple federally and/or state protected species and/or critical habitat(s).

SHUs and SRRUs include a significant part of Alabama's remaining high-quality, free-flowing rivers and streams and reflect the variety of small stream to large river habitats once occupied by these species historically and presently. The 51 SHUs and SRRUs were selected based on the best available information about the essential habitat components required by these species, including the following:

- geomorphically stable stream and river banks and channels;
- a stream flow regime sufficient for normal behavior, growth, and survival of all life stages of mussels and their fish hosts;
- acceptable water-quality conditions necessary for normal behavior, growth, and viability of all life stages;
- sand, gravel, and/or cobble substrates with low amounts of both fine sediment and attached filamentous algae;
- the presence of fish hosts with adequate living, foraging, and spawning areas; and
- few or no competitive or predaceous nonnative species.

The USFWS, in cooperation with the Alabama Aquatic Biodiversity Center (AABC) of ADCNR, the GSA, and the Alabama Clean Water Partnership (ACWP), has initiated the following activities designed to enhance species recovery opportunities in the 51 SHUs and SRRUs.

- Development of SHU-specific watershed and threats information. For successful species recovery, watersheds must be understood from a biological, water quality, habitat, and land-use perspective. The type of watershed information developed for each SHU is determined by the type and intensity of threats posed. This information may include, but is not limited to, additional biological surveys to refine species distributions; surveys to determine water-quality threats that may affect listed species; a landscape analysis to determine land cover and land use patterns, SHU watershed characteristics, and land cover changes through time; studies to better understand biological phenomena (reproduction periods, migration routes, breeding habitats, etc.) that are important for managing and recovering species; hydrogeologic studies to determine groundwater characteristics and recharge areas for spring- and cave-dwelling species; biomonitoring studies to evaluate the causes of habitat impairment and examine hydrologic processes shaping and degrading habitat.



Strategic Habitat Units (SHUs) and Strategic River Reach Units (SRRUs).
Unit numbers are grouped by HUC subregion color. Unit numbers in red are SRRUs.

Unit	Name	Unit	Name
1	Bear Creek	26	Bogue Chitto Creek
2	Tennessee R.-Wilson dam tailwater	27	Cahaba River
3	Cypress Creek	28	Coosa R.-Jordan dam tailwater
4	Shoal Creek	29	Hatchet Creek
5	Elk River	30	Yellowleaf Creek
6	Limestone, Piney, Beaverdam Creeks	31	Coosa R.-Logan Martin dam tailwater
7	Tennessee R.-Guntersville dam tailwater	32	Kelly Creek
8	Flint River	33	Lower Choccolocco Creek
9	Paint Rock River	34	Cheaha Creek
10	Tennessee R.-Nickajack dam tailwater	35	Shoal Creek
11	Lower Tombigbee River	36	Big Canoe Creek
12	Sucarnoochee River	37	Weiss Lake bypass (Dead River)
13	Trussels Creek	38	Terrapin Creek
14	Sipsey River	39	Upper Coosa River tributaries
15	Lubbub Creek	40	Uphapee Creek
16	Coalfire Creek	41	Tallapoosa River
17	Luxapalila Creek	42	Conecuh River
18	Buttahatchee River	43	Murder Creek
19	East Fork Tombigbee River	44	Amos Mill Creek
20	Bull Mountain Creek	45	Five Runs Creek
21	North River	46	Lower Pea River
22	Upper Sipsey Fork	47	Upper Pea River
23	Locust Fork	48	Choctawhatchee River
24	Lower Alabama River	49	West Fork Choctawhatchee River
25	Big Flat Creek	50	Chipola River
		51	Uchee Creek

Figure 1.—Strategic habitat and river reach units for aquatic species of conservation concern in Alabama and associated Hydrologic Unit Code (HUC) subregions.

- Identification of areas needing protection. Using the threats and watershed assessment data, stream reaches that need protection, management, and/or restoration can be identified. Linking the location of imperiled species with specific threats is a critical part of this process. Such linking can only be accomplished in necessary detail by conducting SHU-specific assessment studies.
- Development of an action plan for species recovery and restoration. Once threats are linked with species, an action plan for recovery can be developed so that species restoration can begin. The action plan is implemented through a cooperative partnership of local landowners, organizations, and agencies including watershed partnerships, local and county governments, local businesses and farmers, state and federal agencies, and other interested parties using a variety of means, including protecting stream habitat through landowner conservation agreements; management of habitat and water quality by eliminating polluted runoff sources and by reducing pollutant loads through water-quality permitting and best management practice (BMP) implementation; conducting riparian improvement or physically repairing a substantially degraded stream reach; restoration of biodiversity with culture-raised species; and implementing a broad spectrum of educational initiatives aimed at school children, government officials and regulators, landowners and business professionals, and the general public with the intent to provide science-based information about the watershed and water resources and their collective importance to the economic and ecological health of the region.

The agencies and organizations involved in this project have initiated studies of selected SHUs in the Mobile River Basin and have established the AABC for the purpose of species culture, restoration, and enhancement. This report presents watershed assessment information for the Big Canoe Creek SHU and offers suggestions and a proposed action plan for restoration activities.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of Paul Hartfield and Bill Pearson of the USFWS for providing guidance and support for the SHU concept and encouraging use of the watershed approach for species recovery and restoration. Many thanks to the following landowners and individuals from various agencies and organizations for providing access and field support with fish biomonitoring sampling, mussel sampling, and habitat assessments in the watershed: Doug Morrison, Bryan Burgess, Gerald Tucker, Rick Findlay, Dewayne Gurley (local landowners); Tom Shepard, Brett Smith, and Cal Johnson (all formerly of GSA); Eric Spadgenske, Jennifer Pritchett, Andy Ford, Josh Rowell, Drew Rollman, Matt Laschet, Karen Marlowe, and Bill Pearson (USFWS, Daphne Ecological Services Office); Alabama Department of Corrections; Paul Freeman and Brittany Walker (The Nature Conservancy); Jeff Baker, Chad Fitch, Steve Krotzer, and Casey Knight (Alabama Power Company); Mike Holly, Dan Catchings, Kevin Baswell, and Andrew Henderson (ADCNR).

STUDY AREA

Big Canoe Creek watershed is part of the Coosa River Basin (fig. 2). The Coosa River originates at the confluence of the Oostanaula and Etowah Rivers near Rome, Georgia. It flows southwest for about 30 miles through Georgia before entering Alabama about 10 miles northeast of Cedar Bluff, Cherokee County. The Coosa River flows for approximately 250 miles in Alabama before joining the Tallapoosa River near Montgomery to form the Alabama River. Along with Big Canoe Creek, other major tributaries to the Coosa River in Alabama include the Chattooga River, Big Wills Creek, Terrapin Creek, Choccolocco Creek, Shoal Creek, Talladega Creek, Yellowleaf Creek, and Hatchet Creek—many of which also contain SHUs and SRRUs for aquatic species of concern. The main stem of the Coosa is nonnavigable to barge and commercial traffic and is modified for hydropower along its entire length in Alabama. The Big Canoe Creek watershed encompasses 225 square miles (mi^2) of the Coosa River Basin in the north-central part of Alabama (figs. 2, 3). From its

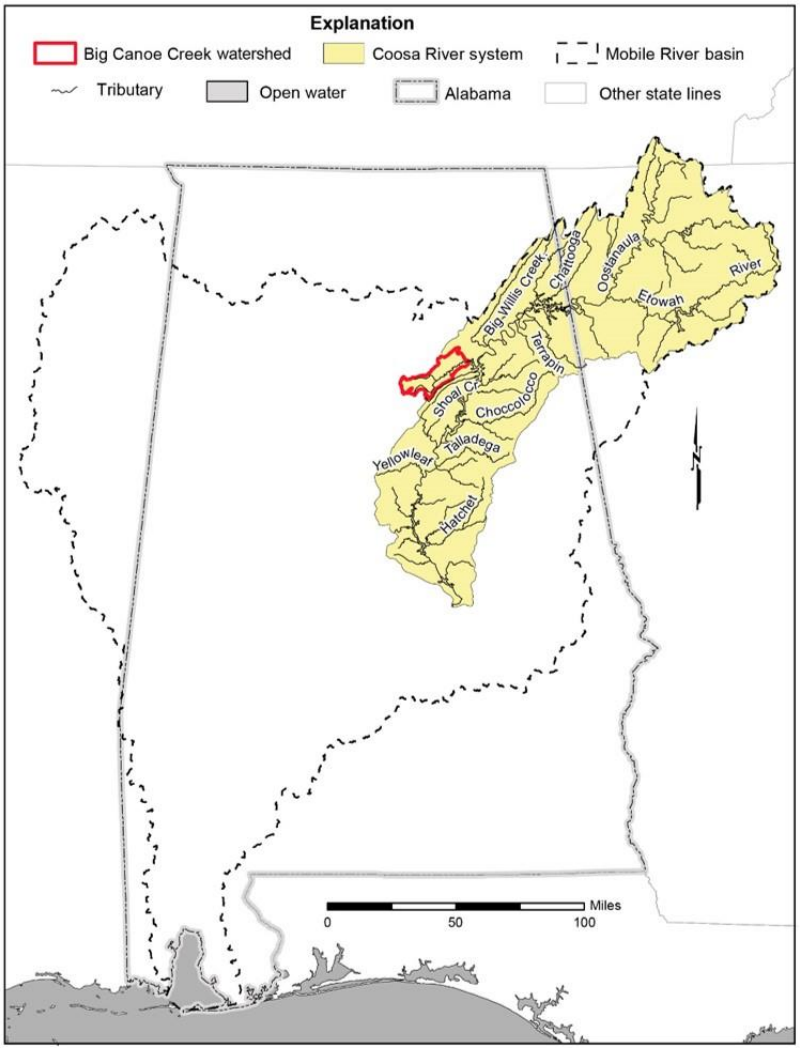


Figure 2.—The Big Canoe Creek watershed is in the Coosa River system and the Mobile River basin.

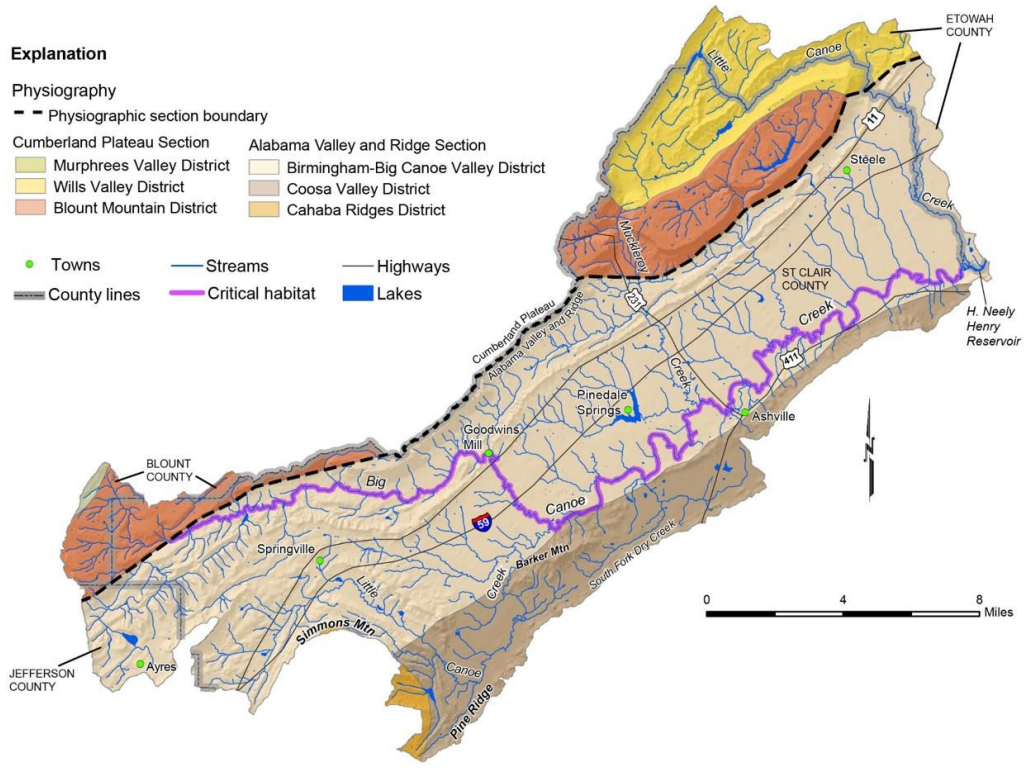


Figure 3.—The Big Canoe Creek watershed.

headwaters in Jefferson and Blount Counties, Big Canoe Creek meanders northeast for 52 miles, joining the Coosa River (H. Neely Henry Reservoir) on the St. Clair-Etowah County line (fig. 3).

The Big Canoe Creek watershed is in two physiographic sections, the Cumberland Plateau in the north and the Alabama Valley and Ridge to the south (figs. 3, 4) (Sapp and Emplaincourt, 1975). The Cumberland Plateau is an undulating surface of sandstone and shale that is frequently dissected by limestone valleys and hollows (Mettee and others, 1996). Three physiographic districts of the Cumberland Plateau define the character of the northeast and western extremes of the Big Canoe Creek watershed: Blount Mountain, Murphrees Valley, and Wills Valley (figs. 3, 4). Blount Mountain is a plateau of impervious sandstones and shales with well-developed joints. Erosion has occurred along the joint surfaces and formed polygonal blocks separated by deep gullies (Neilson, 2007). Murphrees Valley and Wills Valley are limestone valleys separated by resistant Pottsville sandstone ridges.

To the south and east of the Cumberland Plateau is the Alabama Valley and Ridge Section (fig. 4), which is a series of tightly folded and thrust-faulted parallel ridges and deep valleys trending northeast-southwest with elevations ranging from 600 to 2,100 feet. The ridges are Pennsylvanian sandstone and chert while the valleys are generally developed on

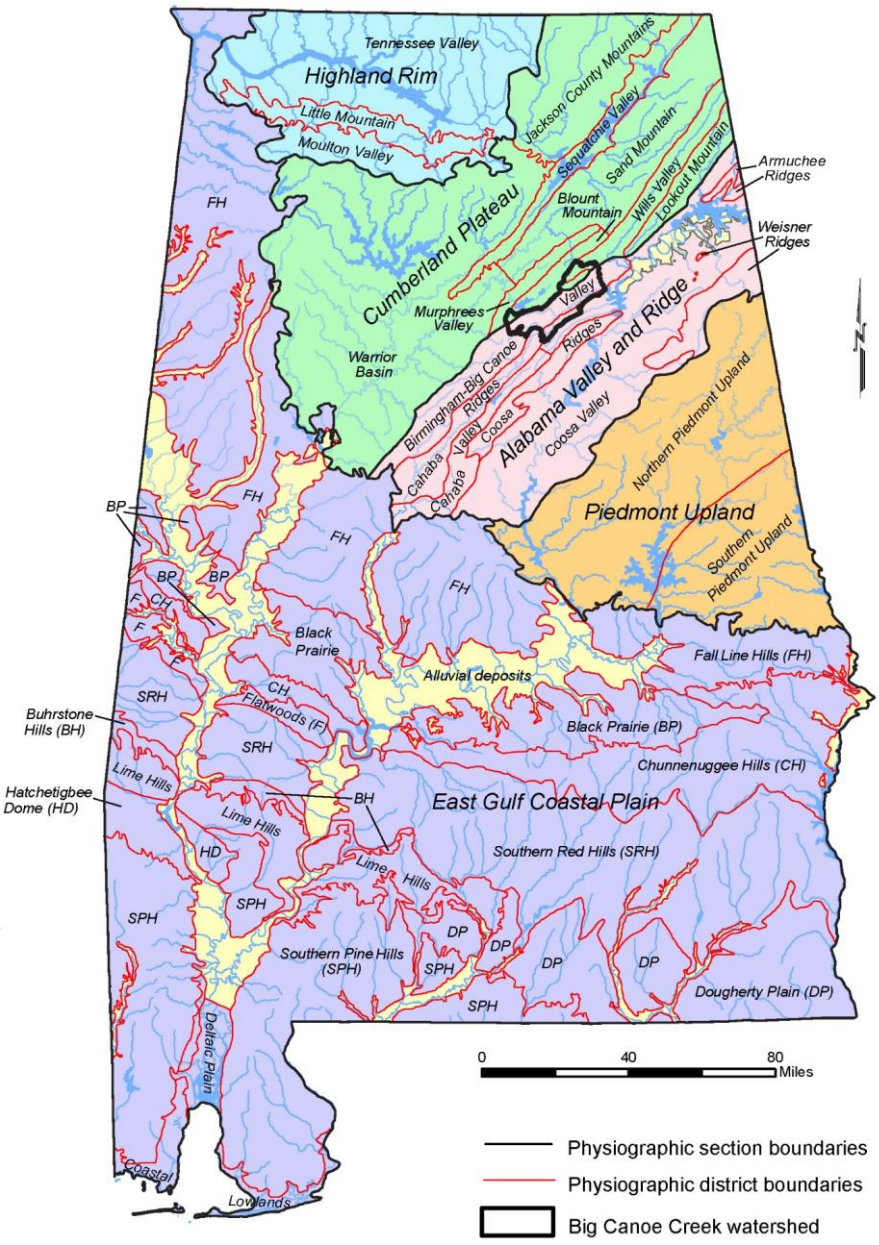


Figure 4.—Alabama physiography (modified from Sapp and Emplaincourt, 1975).

limestone, shale, and dolomite (Mettee and others, 1996). Big Canoe Creek drains three districts of the Alabama Valley and Ridge Section: Coosa Valley, Cahaba Ridges, and Birmingham-Big Canoe Valley (fig. 3). The Coosa Valley District forms the southeast boundary of the watershed and is characterized by quartzite along Pine Ridge and Barker Mountain (Sapp and Emplaincourt, 1975). The Cahaba Ridges District consists of folded Pottsvillle Formation sandstone and conglomerate beds in the extreme southwest part of the watershed, around Simmons Mountain (fig. 3). About 65 percent of the Big Canoe Creek watershed is in the Birmingham-Big Canoe Valley District. The Birmingham-Big Canoe Valley is about 30 miles long and 5 miles wide in the Big Canoe watershed and has

developed on folded and thrust-faulted Lower Paleozoic limestone and dolomite, with exposed formations of shale, sandstone, and chert (Sapp and Emplaincourt, 1975; Neilson, 2007).

Sandstones and shales of the Cumberland Plateau form impervious polygonal blocks with streams typically flowing along the well-developed joints. The resulting rectangular — drainage pattern (fig. 5) has straight line segments with right angle bends and tributaries also entering at right angles. Another distinctive drainage pattern found in Big Canoe Creek is the trellis pattern (fig. 5). Trellis drainage is characteristic of folded mountains; as a river flows along a strike valley, smaller tributaries feed into it from the steeper slopes on the sides of the valley. These tributaries enter the main river at approximately right angles, causing a trellis-like appearance (fig. 5) of the drainage system (Ritter, 2006). These two drainage patterns occur in many of the headwater streams of the watershed. The dendritic pattern is most prevalent in the more soluble rock found in the Birmingham-Big Canoe Valley District.

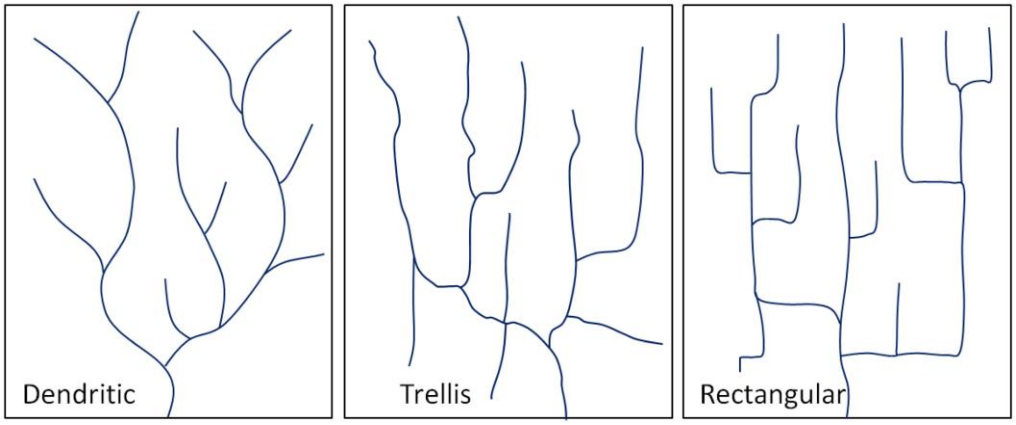


Figure 5.—Drainage patterns found in the Big Canoe Creek watershed (Earle, 2015).

WATERSHED EVALUATION

LAND USE AND LAND COVER

The 2011 National Land Cover Dataset (NLCD), provided by the Multi-Resolution Land Characteristics Consortium, was utilized to determine land cover statistics in the Big Canoe Creek (U.S. Geological Survey (USGS), 2011). Approximately 59 percent of the Big Canoe Creek watershed is covered by evergreen and mixed deciduous forest (table 1, fig. 6). Forestry activities are common in the central Canoe Creek and Little Canoe Creek (west) valleys. Pasture is the next most common land usage at 18 percent (fig. 6) and small farms are common throughout the watershed. Land used for cultivated crops is 2.3 percent, with a local vegetable crop industry on the top of Chandler Mountain and some farms in the lowest reach of the Big Canoe Creek valley (fig. 6). Developed land occupies 6 percent of the watershed (fig. 6), and includes urban centers in Ashville, Springville, and Steele. The

Table 1.—Area and percent of land use/land cover classes in the Big Canoe Creek watershed (USGS, 2011).

Land cover classes	Square miles	Percent
Open water	2.1	0.91
Developed, open space	11.2	5
Developed, low intensity	2.1	0.95
Developed, medium intensity	0.59	0.26
Developed, high intensity	0.15	0.06
Barren land	1.2	0.52
Deciduous forest	95.4	42.2
Evergreen forest	25.4	11.2
Mixed forest	12.7	5.6
Shrub/scrub	11.2	5
Herbaceous	10	4.4
Hay/pasture	41.7	18.5
Cultivated crops	5.4	2.3
Woody wetlands	6.6	2.9
Emergent herbaceous wetlands	0.18	0.08
Total watershed area	226	100

Springville area is beginning to experience significant growth as the Birmingham-Jefferson County population migrates northeast along the I-59 corridor. Extensive woody wetland exists in the lower reaches of Little Canoe Creek (west), in the flatlands near the junction of Little Canoe Creek (west) and Big Canoe Creek, and along the lower reaches of Big Canoe Creek downstream of Ashville (fig. 6).

Little Canoe Creek (east) drains an upland area north of Chandler Mountain that is dominated by forest and pastureland. As Little Canoe exits this region, it plummets down Red Mountain, cuts across Texas Ridge, flows into Canoe Creek Valley, and joins Big Canoe Creek near the backwaters of H. Neely Henry Reservoir. Gulf Creek drains the top of Chandler Mountain, an area of intensive crop agriculture and pastures. After merging with Jake Creek, Gulf Creek cascades off the mountain, crosses Beason Cove, cuts through Texas Ridge, and flows south and east through Big Canoe Valley before converging with Big Canoe Creek. Muckleroy Creek drains parts of Beason and Crawfords Coves (the area between Chandler and Blount Mountains), then cuts through Texas Ridge and enters Big Canoe Creek upstream of Ashville. Pinedale Lake, a small developed lake community in the central part of the watershed, is supplied by several small unnamed tributaries. Outflow from Pinedale Lake enters Big Canoe Creek just upstream of Muckleroy Creek. Dry Creek is a small subwatershed that drains Bucks Valley and flows northwest feeding into Big Canoe Creek between Ashville and the mouth of Little Canoe Creek (west). Little Canoe Creek (west) drains evergreen and deciduous forests at its upper reaches and extensive pasture areas near stream channels and woody wetlands along its lower reaches. Stormwater runoff from Springville enters the upper reaches of Little Canoe Creek (west) and the Springville wastewater treatment plant discharges into Little Canoe Creek near Hickman Lake. Crooked and Dry Creeks (upper tributaries to Little Canoe Creek east) drain the Simmons Mountain region, which is characterized by steep ridges and small impoundments in a former coal mining area. Upper Big Canoe Creek (from U.S. Hwy.11 upstream) drains the south flank of Blount Mountain and is heavily forested, with extensive pasture land along the main channel.

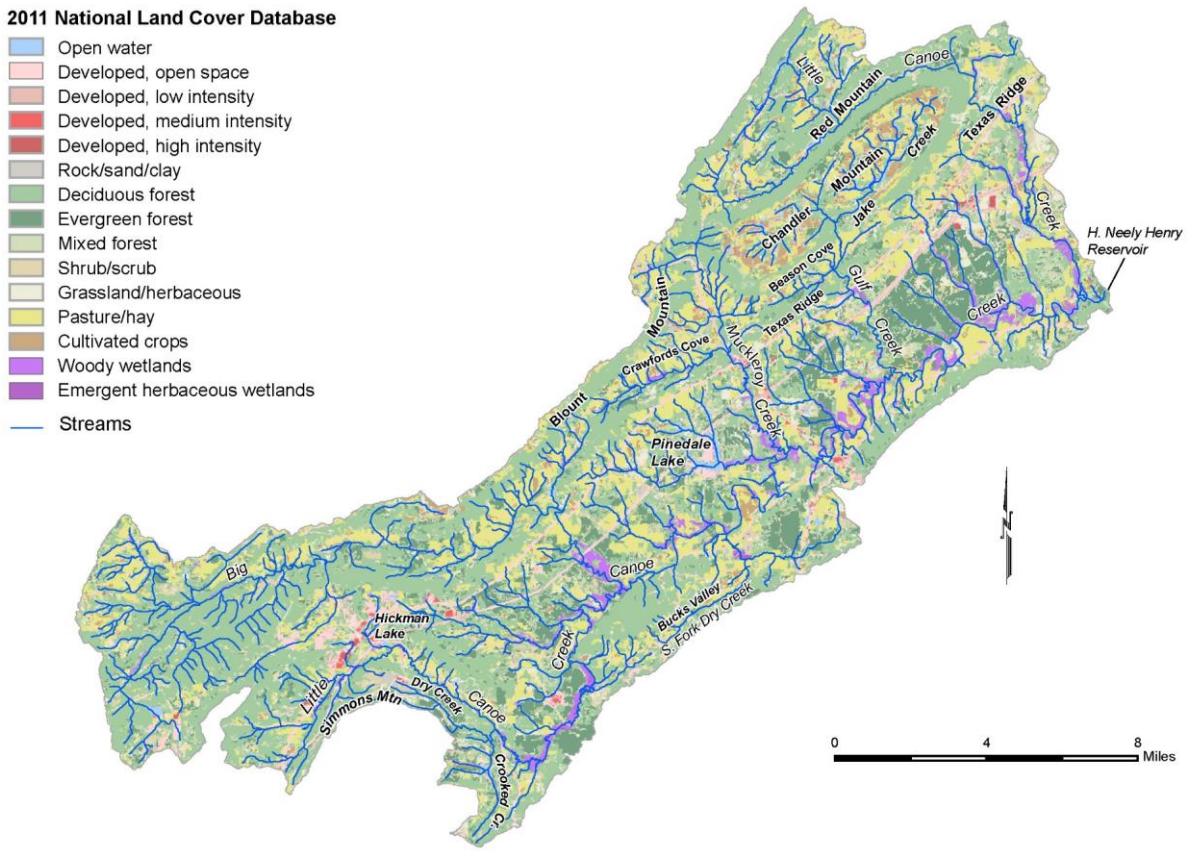


Figure 6.—Land use/land cover in the Big Canoe Creek watershed (USDA NRCS, 2011).

WATER RESOURCES

GROUNDWATER

Average annual precipitation in the region is 57 inches per year (Oregon State University, 2007). Approximately 20 to 24 inches per year runs off the surface into streams, and about 12 inches per year recharges groundwater aquifers (Kopaska-Merkel and others, 2005). The remaining precipitation either returns to the atmosphere through evapotranspiration or is used for productive purposes in the region.

Groundwater is reliably found in the Valley and Ridge and Mississippian aquifer systems (fig. 7). The Pottsville aquifer is not a reliable source of large amounts of groundwater, but has been used as a source of water when no other aquifer is available. Areas underlain by the sandstone-based Pottsville aquifer contain softer groundwater than areas underlain by the predominantly carbonate formations of the Mississippian and Valley and Ridge aquifer systems (fig. 8).

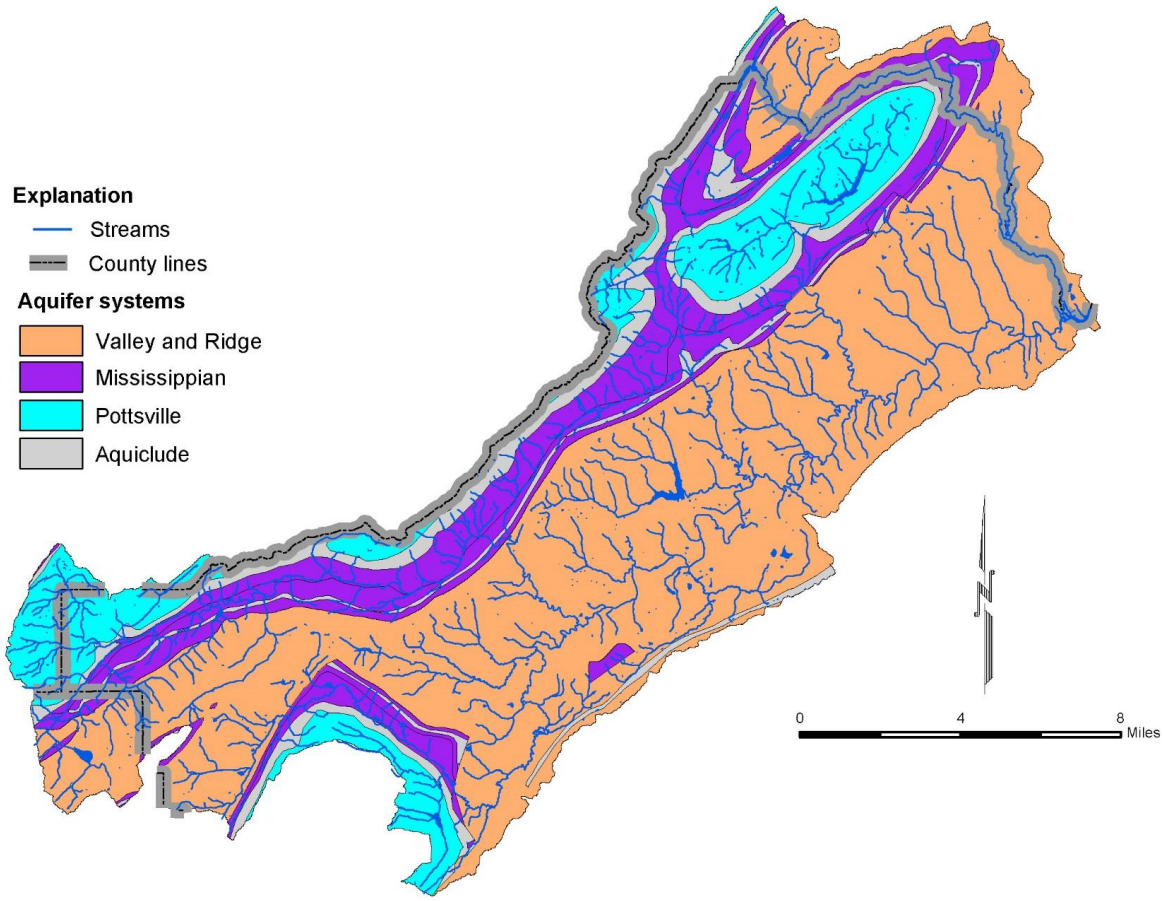


Figure 7.—Aquifer systems in the Big Canoe Creek watershed.

Most wells in the Cumberland Plateau are completed in the Pottsville aquifer, where iron concentrations are variable but locally high (fig. 9), whereas groundwater in Mississippian aquifers in the Valley and Ridge physiographic section are relatively low in iron. Water with iron concentrations in excess of 0.3 milligrams per liter (mg/L) can stain plumbing fixtures, and the U.S. Environmental Protection Agency (USEPA) has defined 0.3 mg/L of dissolved iron as a secondary maximum contaminant level allowed in drinking water (USEPA, 2015b).

A large part of aquifer recharge is discharged to streams as baseflow through seeps and springs. Springville's public water supply originates from a spring that discharges between 900 and 2,200 gallons per minute (gal/min). Other large springs in St. Clair County are Muckleroy Spring (570 to 7,800 gal/min) and Ashville Spring (115 to 1,040 gal/min) (Chandler and Moore, 1987). Groundwater from wells and springs is the source of all residential and public supply water in the Big Canoe Creek watershed in St. Clair County (USGS, 2005). In 2005, the USGS reported that public water supply use was 8.13 million gallons per day (Mgal/d), which was up from 6.78 Mgal/d reported in 1995 (Kopaska-Merkel and others, 2005).

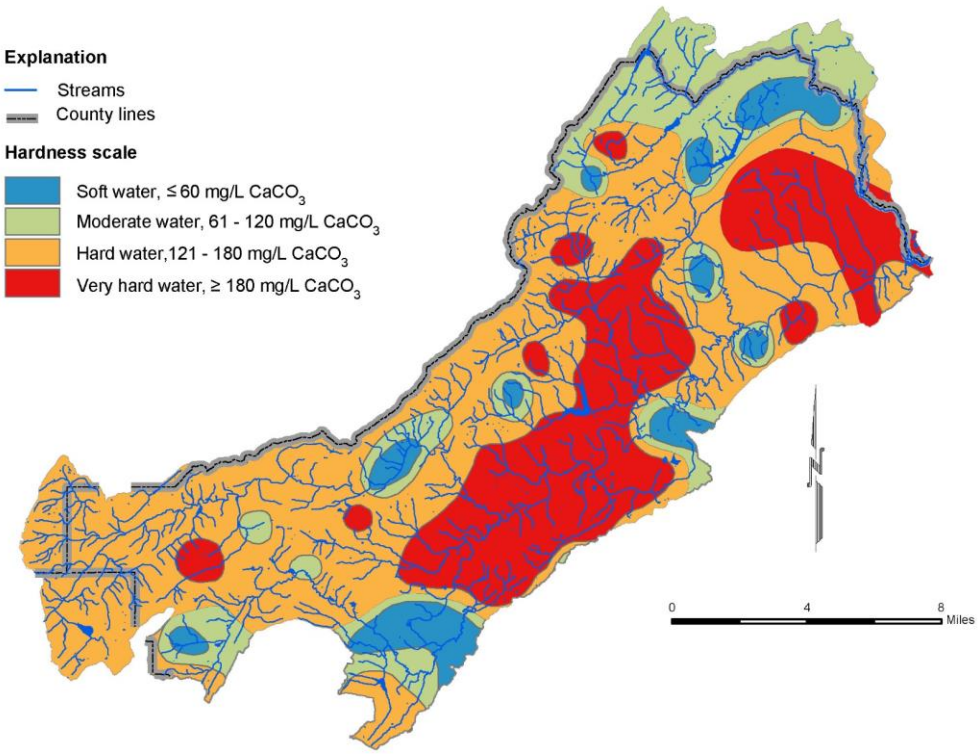


Figure 8.—Hardness of groundwater in the Big Canoe Creek watershed (Kopaska-Merkel and others, 2005).

SURFACE WATER

The USGS discharge station 02401390 at Ashville (site 6) is the only continuous stream flow gauge currently operating in the watershed (USGS, 2013). Average annual discharge for Big Canoe Creek at this site from 1967 to 2010 was 264 cubic feet per second (ft^3/s), ranging from an annual average of 83.1 ft^3/s in water year 2007 to 423 ft^3/s in water year 1973 (fig. 10). August has on average the lowest flows and March the highest (fig. 11). The lowest average daily discharge over the period of record at this site was 6.9 ft^3/s on October 16, 2007, and the highest average daily discharge was 11,200 ft^3/s on November 24, 2004. The highest peak discharge was 13,600 ft^3/s on April 13, 1979 (corresponding to an approximately 100-year flood event).

Drainage density of the Big Canoe Creek watershed is 2.3 stream miles for each square mile of land surface (USGS, 1999). This low drainage density suggests a highly permeable landscape with low potential for runoff (Ritter and others, 2002). The 7-day 10-year low flow ($7Q_{10}$) in the Big Canoe Creek watershed (fig. 12, table 2) ranges from 0.01 ft^3/s (Gulf Creek near Steele) to 13 ft^3/s (Big Canoe Creek near Gadsden). Converting the low flow $7Q_{10}$ statistic to a square-mile basis ($ft^3/s/mi^2$) standardizes flows with respect to watershed area. When applying the $7Q_{10}$ values in figure 12 and table 2, we observe that low flows are greatest in the upper reaches of Big Canoe Creek near Springville (0.124 $ft^3/s/mi^2$). This low flow is about one and a half times greater than low flows for Big Canoe Creek at Ashville (0.085 $ft^3/s/mi^2$) and about twice that of Little Canoe Creek (east) at Steele

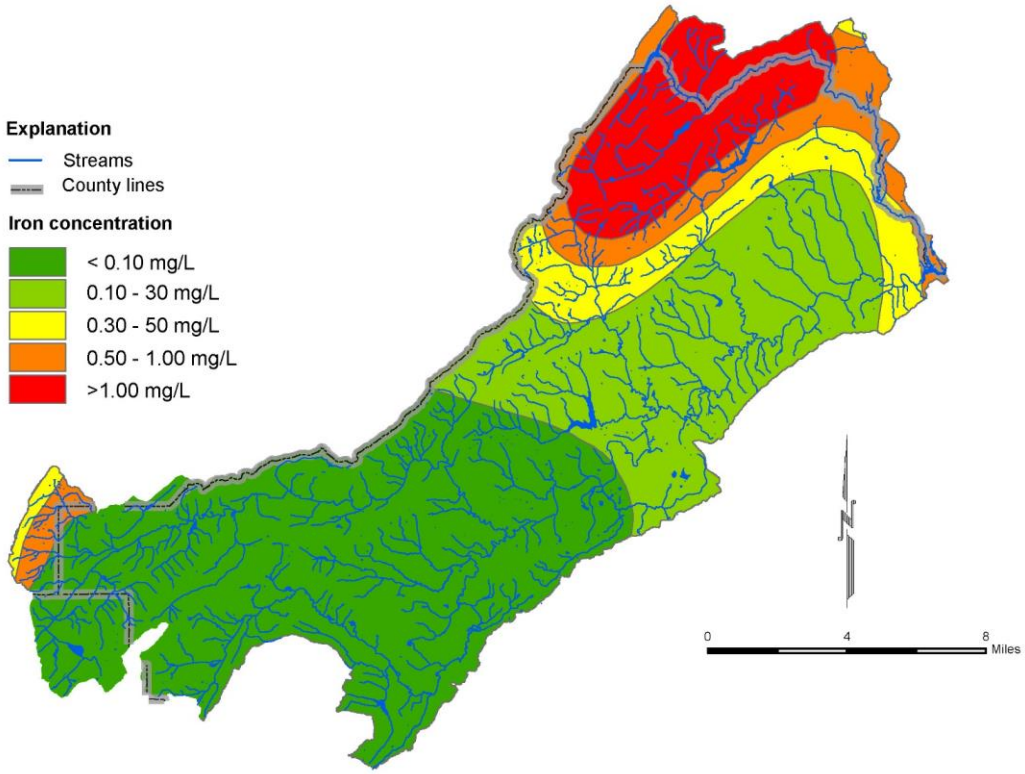


Figure 9.—Iron content of groundwater in the Big Canoe Creek watershed (Kopaska-Merkel and others, 2005).

(0.062 $ft^3/s/mi^2$). Spring influences and low drainage density contribute to the greater low flows in the upper reaches of Big Canoe Creek and Little Canoe Creek (west).

Water quality data have been collected by various agencies, organizations, and institutions, including the USEPA, USGS, the Alabama Department of Environmental Management (ADEM), Auburn University, and the Alabama Water Watch (AWW) (table 3, fig. 13). A summary of water quality parameters measured at most sites in Big Canoe Creek is presented in table 4 and figure 14. Values are reflective of a rural watershed influenced by small-scale agriculture and small, developing towns. Median dissolved oxygen was 8.3 mg/L, ranging from 5.2 to 14.5 mg/L, indicating good overall dissolved oxygen conditions in the watershed. Alkalinity is generally elevated in Big Canoe Creek due to limestone aquifers, which slightly elevates the pH of its waters (median =7.5 with a range of 6.3 to 8.5 units).

Water in Big Canoe Creek and its tributaries is generally soft to moderately hard with hardness greatest during base flow conditions experienced during drier periods. Hardness and dissolved solids are elevated due to dissolution of calcium, bicarbonate, and magnesium from limestone rocks. Water samples indicate an average to low level of fertility in streams with a median nitrate of 0.27 mg/L as N and a median total phosphorus of 0.048 mg/L as P. Iron and manganese occur in low concentrations, while trace metals are either less than detection limits or in very low concentrations. Water temperature in Big Canoe Creek ranges from 3°C in January and February to 28°C in July and August (Harkins, 1980).

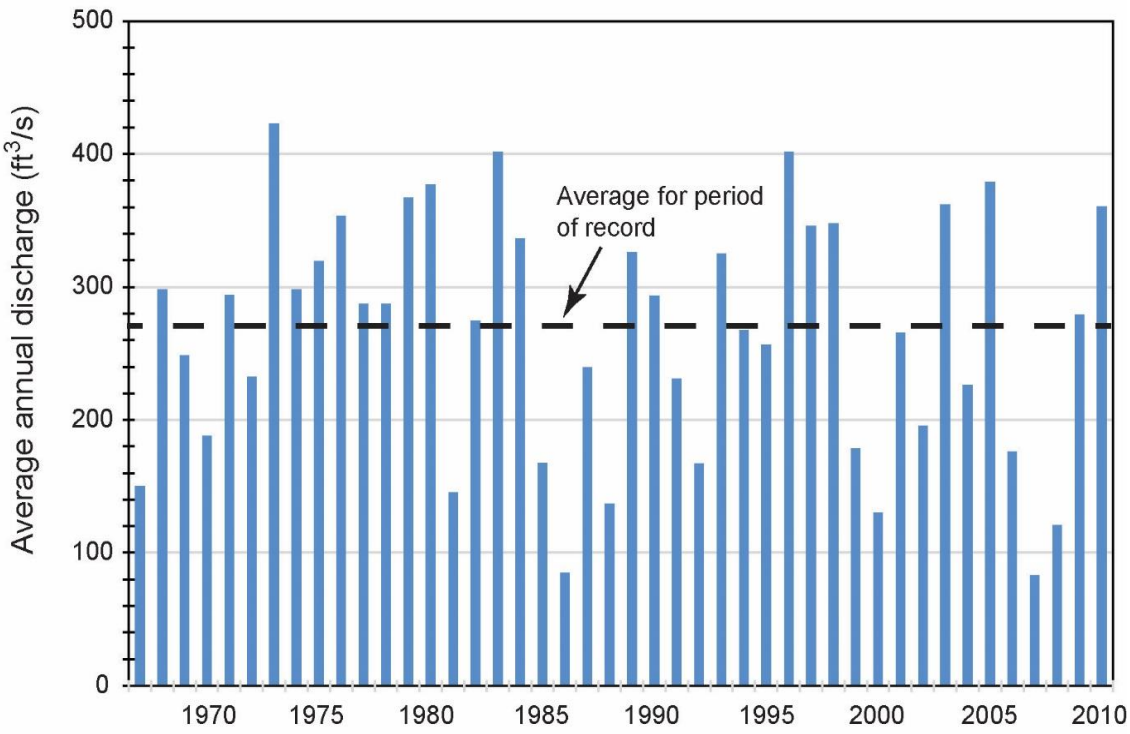


Figure 10—Average annual discharge for USGS site 02401390, Big Canoe Creek at Ashville, water years 1967-2010.

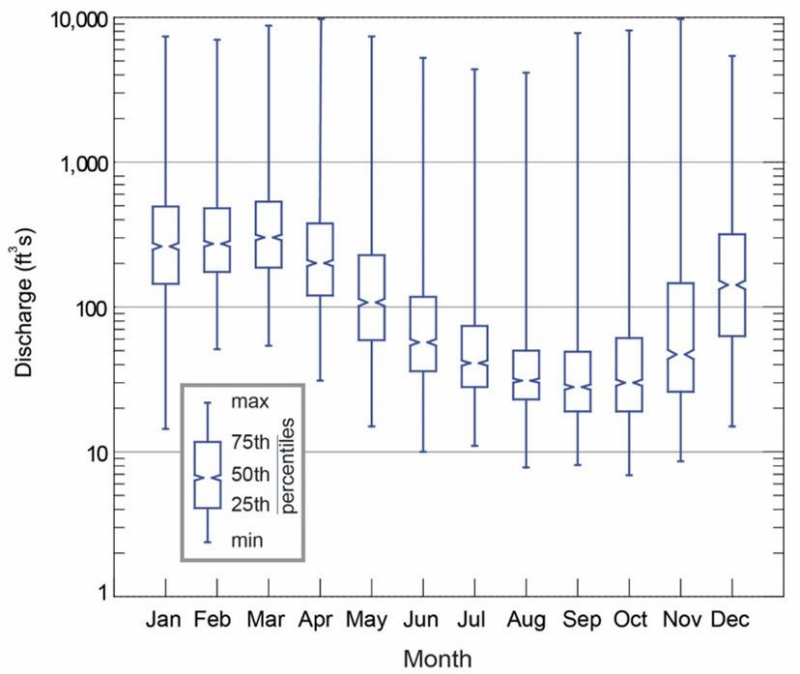


Figure 11.—Distribution of average daily flows by month for USGS site 02401390, Big Canoe Creek at Ashville, water years 1967-2010.

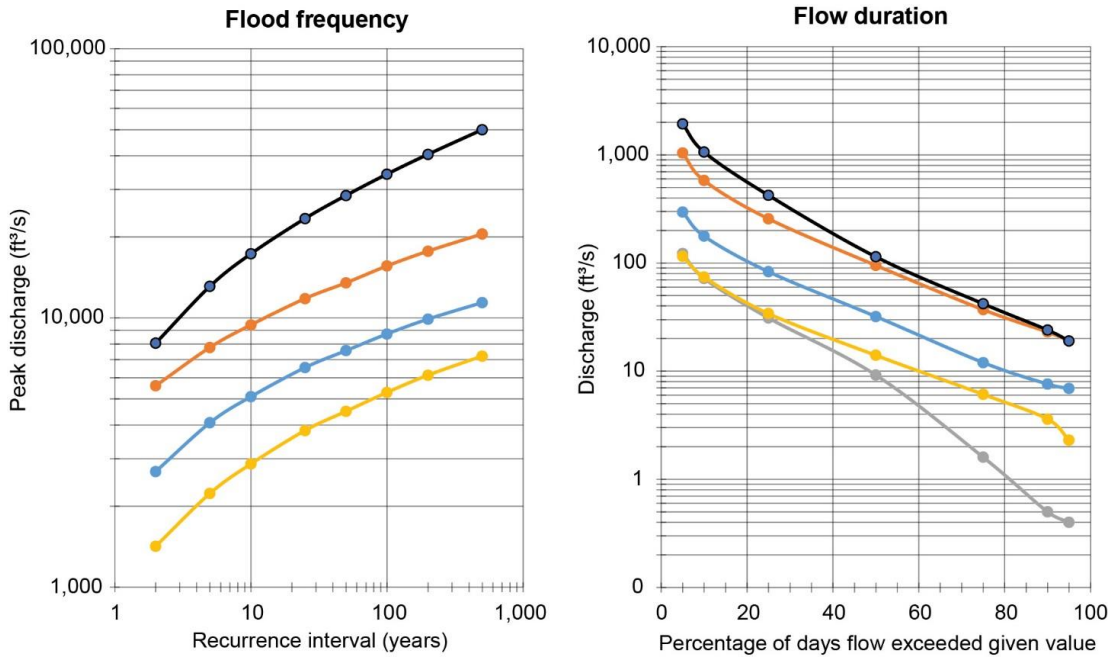


Figure 12.—Flood frequency and flow duration relationships for streams in the Big Canoe Creek watershed (data from Atkins and Pearman, 1994; Atkins, 1996)

Table 2.—Flood frequency and flood duration relationships for streams in the Big Canoe Creek watershed. See figure 13 for site locations.

Symbol	USGS Station No.	Site No.	Location	Drainage area (mi^2)	Period of record	$7Q_2$ (ft^3s)[a]	$7Q_{10}$ (ft^3/s)[a]	Max peak discharge (ft^3/s)[b]
	02401500	1	Big Canoe Cr. near Gadsden	253	Oct 1937-Sep 1965	20	13	37,900
	02401470	2	Little Canoe Cr. (east) near Steele	22.3	Apr 1982-Sep 1990	2.5	1.4	3,310
	02401460	4	Gulf Cr. at U.S. Hwy. 11	14.3	Oct 1978-Sep 1985	0.4	0.2	--
--	02401450	5	Gulf Cr. at Beason Rd. (St. Clair Co. Hwy. 295)	9.88	Oct 1976-Sep 1979	0.2	0.01	--
--	02401390	6	Big Canoe Cr. at U.S. Hwy. 231 (Ashville)	141	Oct 1965-Sep 1990	19	12	13,600
	02401370	15	Big Canoe Cr. near Springville	45.0	Oct 1978-Sep 1990	7.3	5.6	4,870

[a] data from Atkins and Pearman (1994)

[b] data from Atkins (1996)

In 1996, ADEM adopted a basin-wide approach to nonpoint source monitoring using a repeating 5-year management rotation cycle. A screening assessment of the Coosa River system in Alabama was performed by ADEM in 2000 (ADEM, 2002) as part of this rotation. The results of this assessment were utilized in the creation of watershed management plans for the upper, middle, and lower sections of the Coosa River in Alabama. Estimates of NPS impairment potential from animal husbandry activities (based upon local Soil and Water Conservation District animal population estimates) in the Big Canoe subwatershed were moderate, with broiler poultry and swine being major contributors. Sedimentation had a low potential for nonpoint source (NPS) impairment, and pasture land use had a moderate potential to become a NPS impairment. The overall potential for NPS impairment was estimated as low.

ADEM performed water quality, macroinvertebrate, and habitat assessments at sites in the Big Canoe Creek watershed as part of their 2005 evaluation of the Alabama, Coosa, and Tallapoosa (ACT) River Basins (ADEM, 2005). These assessments were used to determine biological integrity and estimate overall water quality within the ACT basin. The three sites sampled in the Big Canoe Creek watershed for this study are listed in table 3 and figure 13. Site numbers 2 and 16 scored in “fair” biological condition, while site number 5 was rated “poor” condition. Site number 2 had significant sediment deposition and scoured banks with poor vegetative cover with the overall habitat score in the suboptimal range. Site number 16 scored marginal for both sedimentation and bank stability but rated optimal with respect to overall habitat quality. Chlorophyll *a* was noted as high for both sites 2 and 16. Site number 5 rated in “poor” biological condition with poor taxa richness scores, very poor to fair taxonomic composition measures, and poor tolerance measures. Overall habitat quality rated marginal with impairment noted in bank and vegetative stability and riparian buffer width. Poor biological condition scores were related to the marginal habitat quality and bank scouring at site number 5. Water quality sampling also suggested nutrient enrichment at this site, perhaps related to nearby cultivated fields.

BIOLOGICAL RESOURCES

Samples of freshwater mussels, snails, fishes, and crayfishes have been collected through the years in Big Canoe Creek for studies of general faunal distribution and status. Current work of GSA has focused more on biological sampling for assessment of water quality and biological condition of streams and waterways. Table 5 lists collection sites and figure 15 displays where these sample sites are located within the Big Canoe Creek watershed.

Table 3.—Water quality sampling sites in the Big Canoe Creek watershed.

Site No.	Agencies/ Organizations	Location	Latitude	Longitude
1	USGS	Big Canoe Cr. near Gadsden	33.9031	-86.1103
2	ADEM, USEPA, USGS	Little Canoe Cr. (east) near Steele	33.9701	-86.1789
3	ADEM	Little Canoe Cr. (east) near Rock Bridge Rd. (off Etowah Co. Hwy. 35)	33.9815	-86.2311
4	USGS	Gulf Cr. at U.S. Hwy. 11	33.9023	-86.2475
5	ADEM, USGS	Gulf Cr. at Beason Rd. (St. Clair Co. Hwy. 295)	33.9180	-86.2523
6	Auburn University, ADEM, USGS	Big Canoe Cr. at U.S. Hwy. 231 (Ashville)	33.8397	-86.2628
7	ADEM	Muckleroy Cr. at U.S. Hwy. 231	33.8780	-86.3042
8	USEPA	Early Cr. at Huff Lane	33.8726	-86.3236
9	USGS	Muckleroy Spring near Whitney	33.8959	-86.3114
10	ADEM	Big Canoe Cr. at St. Clair Co. Hwy. 36	33.8328	-86.2835
11	AWW	Big Canoe Cr. at John Ramsey Rd. and Ala. Hwy. 23	33.7974	-86.3285
12	ADEM	Little Canoe Cr. (west) at Beulah Circle (off Ala. Hwy. 23)	33.7801	-86.3626
13	USGS	Little Canoe Cr. (west) downstream of Hickman Lake	33.7670	-86.4575
14	USGS	Little Canoe Cr. (west) on Mtn. View Rd. between Ala. Hwy. 11 and I-59	33.7526	-86.4861
15	AWW, USGS	Big Canoe Cr. near Springville	33.8137	-86.3816
16	ADEM	Big Canoe Cr. at St. Clair Co. Hwy. 31	33.8043	-86.4197
17	AWW	Big Canoe Cr. near 370 Oak Grove Rd. (off of St. Clair Co. Hwy. 9)	33.8065	-86.4814
18	USGS	Big Canoe Cr. tributary upstream of Canoe Lake	33.7937	-86.4886
19	USGS	Big Canoe Cr. at Canoe Cr. Rd.	33.7932	-86.5172

MOLLUSKS AND CRAYFISHES

Seventeen species of freshwater mussels historically known from the Mobile River Basin (MRB) are currently listed as endangered or threatened by the USFWS. The decline of most mussel faunas, including those found in the MRB, is attributed to the collective effects of impoundment, sedimentation, eutrophication, polluted runoff, channel modification, and urbanization (Bogan, 1993; Hartfield, 1994; Gangloff and Feminella, 2007; Williams and others, 2008). Other factors affecting the distribution and abundance of freshwater mussels in North America include possible competition by exotic species such as the Asian Clam, *Corbicula fluminea*, and the Zebra Mussel, *Dreissena polymorpha*. The Asian Clam is believed to compete with native mussels for space and food resources and has occupied streams in the MRB since the mid-20th century. The Zebra Mussel had a well-documented affect in a very short time on native mussel populations in lakes, rivers, and streams in Canada and the northern United States after its introduction from Eastern Europe, but it has not been reported from the MRB to date.

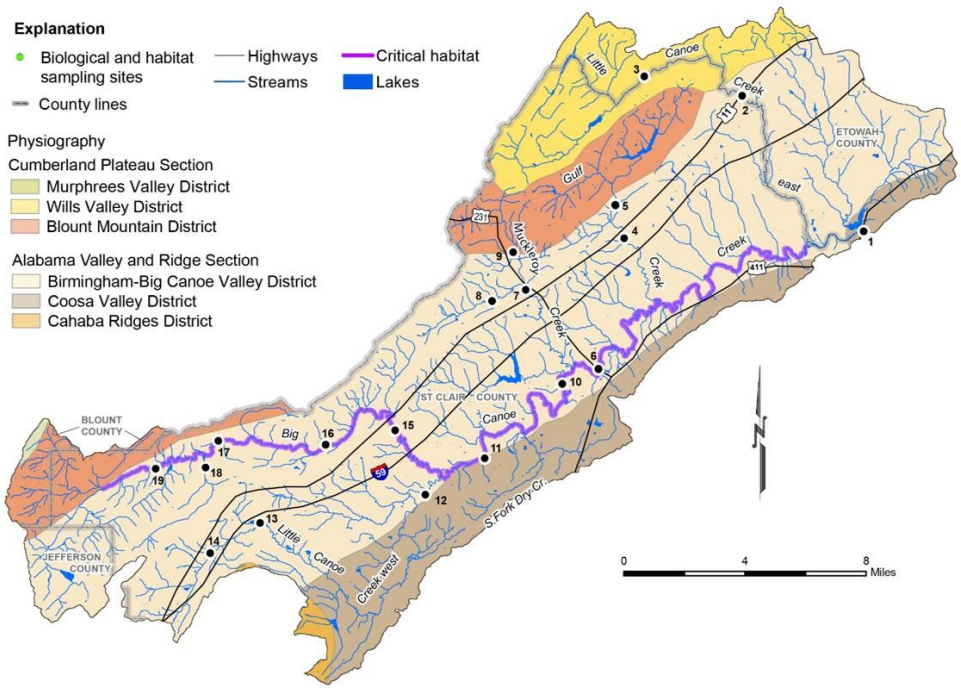


Figure 13.—Water quality sampling sites in the Big Canoe Creek watershed.

The Coosa River system historically supported 64 species of mussels (Gangloff and Feminella 2007; Williams and others, 2008) but only 45 species (38 live) were reported from surveys in 1972 (Hurd, 1974). Previous documentation of the mussel and snail faunas was based on collections by H. H. Smith and A. A. Hinkley (van der Schalie, 1981) prior to construction of impoundments and by Herb Athearn (in litt), Basch (1959), Hurd (1974), Bogan and Pierson (1993), and Herod and others (2001) post impoundment. The extensive collection of freshwater mussels and snails across much of North America, including the Big Canoe Creek system, by Herb Athearn (Museum of Fluviatile Mollusks) is now in the possession of the North Carolina State Museum of Natural Sciences in Raleigh, North Carolina, and the collection is being curated and the associated data entered into a digital database as funding becomes available.

Sampling for freshwater mussels in riverine reaches of the Coosa River downstream of H. Neely Henry, Lay, Logan Martin, and Mitchell Dams, and in Lay and H. Neely Henry Reservoirs during the summers of 2003 and 2004 was summarized in McGregor and Garner (2004). They reported a total of 23 mussel species (19 live) and the Asian Clam from 20 stations sampled, with approximately 21 hours of bottom time logged using a surface air source. One federally listed endangered species was encountered, the Southern Clubshell, *Pleurobema decisum* (2 live animals and several relic shells). Most species encountered were uncommon to rare, and three species accounted for 84 percent of the total catch of live and fresh dead mussels. The Threehorn Wartyback (*Obliquaria reflexa*) (17 percent) was the only species found in all reaches sampled, while the Southern Mapleleaf (*Quadrula apiculata*) (55.7 percent) was missing only from H. Neely Henry reservoir. Many species historically known from the Coosa River main channel in this vicinity have apparently been extirpated or exist in disjunct populations in low numbers.

Table 4.—Summary of water quality information from the Big Canoe Creek watershed, 1966 to 2013 (USGS, 2013).
Abbreviations: N—number of samples; nd—not detected or less than lower limit of detection.

Parameter	Units	N	Med.	Min.	Max.	Avg.
Stream flow	ft^3/s	187	17.0	0.100	2,230	87.9
Water temperature	°C	244	3.0	1.0	28.0	9.9
Dissolved oxygen (DO)	mg/L	158	8.3	5.2	14.5	8.5
DO percent saturation	%	50	80.8	61.7	96.9	80.4
pH	standard units	166	7.5	6.3	8.5	7.4
Bicarbonate	mg/L	23	98.0	42.0	190	104
Carbonate	mg/L	20	3.0	3.0	3.0	3.0
Total hardness (carbonate)	mg/L as $CaCO_3$	129	84.0	16.0	170	86.4
Hardness (non-carbonate)	mg/L as $CaCO_3$	21	7.00	1.00	12.0	6.47
Alkalinity	mg/L as $CaCO_3$	144	80.0	5.4	180	81.5
Fluoride	mg/L	12	0.200	0.100	0.200	0.167
Silica	mg/L	18	5.20	3.60	8.00	5.40
Specific conductance	μS/cm at 25°C	70	173	75	332	176
Total dissolved solids	mg/L	79	109	4.9	214	105
Calcium	mg/L	18	24.9	13.4	42.8	25.7
Magnesium	mg/L	18	3.47	2.30	15.0	5.31
Sodium	mg/L	18	1.32	0.790	2.00	1.34
Potassium	mg/L	18	0.90	0.53	1.50	0.94
Sulfate	mg/L	17	3.93	2.49	6.80	3.99
Chloride	mg/L	55	2.0	0.06	3.36	1.85
Ammonia	mg/L as N	22	0.031	0.007	0.199	0.041
Kjeldahl nitrogen	mg/L as N	73	0.252	0.070	2.23	0.334
Nitrate	mg/L as N	18	0.274	0.050	3.12	0.608
Nitrite	mg/L as N	13	0.015	0.010	0.600	0.160
Nitrate + Nitrite	mg/L as N	96	0.240	0.003	0.706	0.258
Orthophosphate	mg/L as P	34	0.014	0.004	0.087	0.019
Phosphorus	mg/L as P	69	0.048	0.008	0.151	0.049
Aluminum	μg/L	25	1.05	0.300	107	27.4
Antimony	μg/L	19	2.0	2.0	2.0	2.0
Arsenic	μg/L	31	3.00	1.00	70.0	9.87
Cadmium	μg/L	18	nd	nd	nd	nd
Chromium	μg/L	12	nd	nd	nd	nd
Cobalt	μg/L	12	nd	nd	nd	nd
Copper	μg/L	23	nd	nd	nd	nd
Iron	μg/L	30	37.2	0.031	140	43.7
Lead	μg/L	26	nd	nd	nd	nd
Manganese	μg/L	27	18.9	0.011	70.0	23.5
Mercury	μg/L	17	0.150	0.100	0.400	0.175
Nickel	μg/L	11	nd	nd	nd	nd
Selenium	μg/L	13	nd	nd	nd	nd
Silver	μg/L	11	nd	nd	nd	nd
Strontium	μg/L	12	70.0	40.0	90.0	70.8
Thallium	μg/L	2	2.60	1.80	3.40	2.60
Zinc	μg/L	29	20.0	3.20	70.0	25.9
Chlorophyll *a*	mg/m^2	32	2.67	0.300	6.41	2.56
Escherichia coli	cfu/100mL[1]	11	166	18.9	1,000	286
Fecal coliforms	cfu/100mL	31	59.0	2.00	10,200	658
BOD 5-day	mg/L	52	1.00	0.100	9.2	1.34
Total Suspended Solids	mg/L	74	7.00	1.00	72.0	10.2
Turbidity	NTU[2]	129	5.00	0.50	138	9.14

[1]cfu—colony forming units [2]NTU—Nephlometric turbidity units

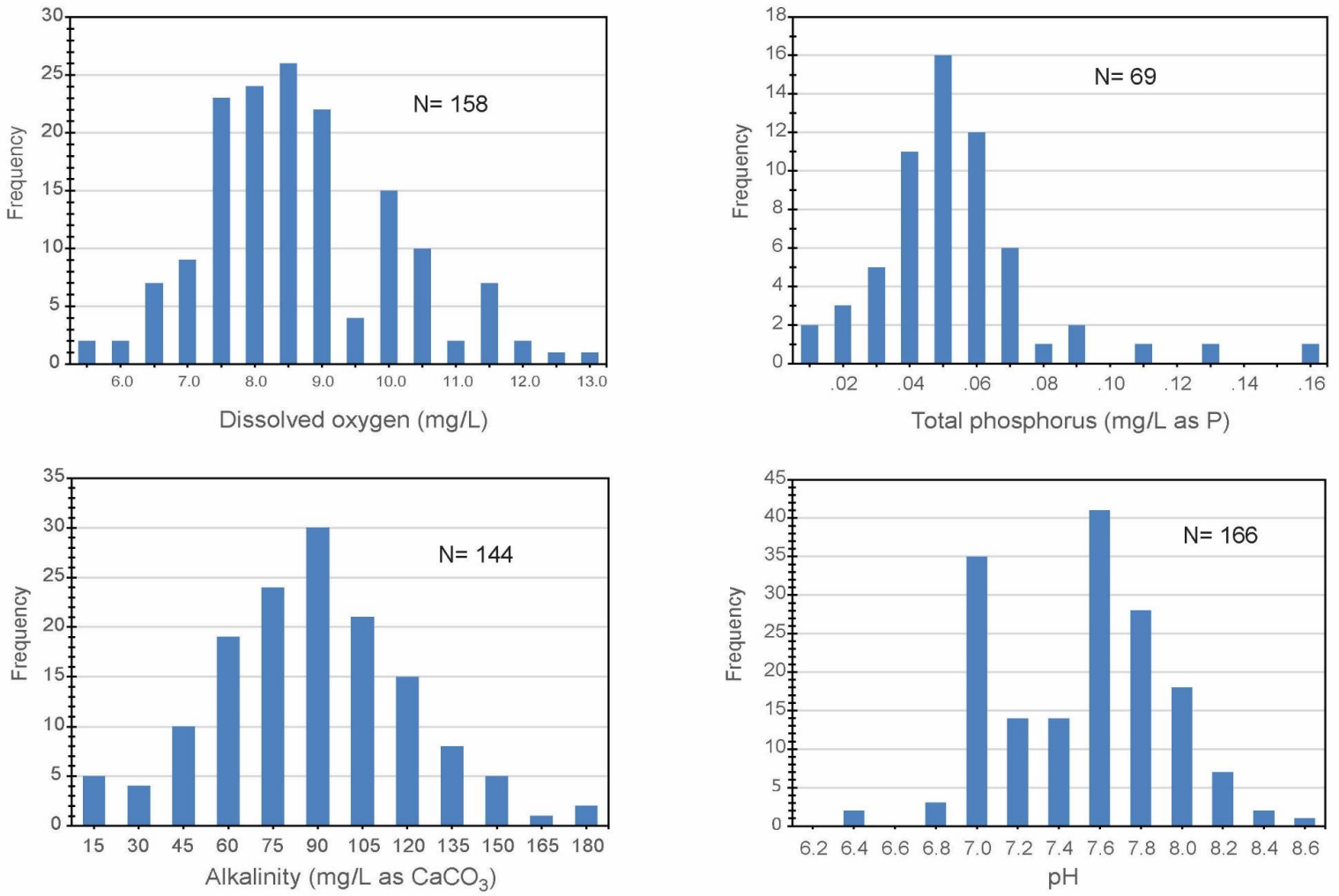


Figure 14 —Frequency distributions of selected water quality parameters at sites in the Big Canoe Creek watershed. Data is combined for all sites; X-axis values represent upper class limit of distribution; N=number of samples.

Table 5.—Biological and habitat sampling sites in the Big Canoe Creek watershed. See figure 15 for site locations.

Abbreviations: X= sampled; H= historic collections >20 years ago.

Site No.	Location	Latitude	Longitude	Sample type			
				IBI	Mussel	Crayfish	Habitat
1	Big Canoe Cr. near U.S. Hwy. 411	33.9030	-86.1102		H		
2	Little Canoe Cr. at Gurley property	33.9256	-86.1661	X	X, H		X
3	Little Canoe Cr. 2.3 mi. east of Steele	33.9393	-86.1673		H		
4	Little Canoe Cr. at Rocky Hollow Road	33.9692	-86.1778	X	X		X
5	Little Canoe Cr. 0.5 mi. upstream of U.S. Hwy. 11 on Rocky Hollow Rd.	33.9723	-86.1842			X	
6	Little Canoe Creek 0.8 mi. upstream of U.S. Hwy. 11 on Rocky Hollow Rd.	33.9731	-86.1908		X	X	
7	Little Canoe Cr. at Rock Bridge Rd.	33.9784	-86.2360	X			X
8	Big Canoe Creek approximately 0.5 mi. N of U.S. Hwy. 411	33.8833	-86.2008		X		
9	Big Canoe Creek at Findlay property	33.8749	-86.2141				X
10	Big Canoe Creek at Burgess property	33.8707	-86.2184	X			X
11	Gulf Creek at Burgess property	33.8732	-86.2342	X			X
12	Big Canoe Creek approximately 2.5 mi. downstream of Ashville	33.8654	-86.2350		X		
13	Big Canoe Cr. at U.S. Hwy. 231	33.8400	-86.2629		X		
14	Big Canoe Cr. 0.3 - 0.6 mi. upstream of U.S. Hwy. 231	33.8398	-86.2682		X		
15	Big Canoe Cr. 0.6 mi. downstream of St. Clair Co. Hwy. 36	33.8422	-86.2763		X		
16	Muckleroy Cr. tributary on U.S. Hwy. 231, 4.1 mi. E of Blount Co. line	33.8725	-86.2938			X	
17	Muckleroy Cr. at U.S. Hwy. 231	33.8785	-86.3041	X		X	X
18	Big Canoe Cr. at St. Clair Co. Hwy. 36	33.8327	-86.2835	X	X	X	X
19	Big Canoe Cr. tributary at St. Clair Co. Hwy. 31, 12.5 mi. SE of Oneonta	33.7965	-86.3333			X	
20	Spring Branch to Little Canoe Cr.	33.7892	-86.3486		H		
21	Little Canoe Cr. between Beulah Circle Rd. and Big Canoe Cr.	33.7848	-86.3607			X	
22	Gin Branch at Beulah Circle Rd.	33.7838	-86.3758			X	
23	Little Canoe Cr. at Beulah Circle Road	33.7801	-86.3626	X	X	X	X
24	Little Canoe Cr. tributary near Red Hill Church, SE of I-59	33.7762	-86.4112			X	
25	Little Canoe Cr. tributary at Riley Farms	33.7681	-86.4020	X			X
26	Little Canoe Creek at Ala. Hwy. 23	33.7670	-86.3745	X			X
27	Little Canoe Cr. 0.25 mi. downstream St. Clair Co. Correctional Rd.	33.7403	-86.3740	X			X
28	Little Canoe Cr. 0.10 mi. upstream St. Clair Co. Correctional Rd.	33.7367	-86.3799	X	X		X
29	Little Canoe Cr. at Ala. Hwy. 174	33.7330	-86.4103	X			X
30	Little Canoe Cr. near Ala. Hwy. 174	33.7554	-86.4433	X			X

Table 5.—Biological and habitat sampling sites in the Big Canoe Creek watershed—**continued**. See figure 15 for site locations.

Abbreviations: X= sampled; H= historic collections >20 years ago.

Site No.	Location	Latitude	Longitude	Sample type			
				IBI	Mussel	Crayfish	Habitat
31	Little Canoe Cr. downstream of Springville Waste Water Treatment Plant	33.7672	-86.4552	X	X		X
32	Tributary of Little Canoe Cr. near U.S. Hwy. 11 on dirt road	33.7759	-86.4701			X	
33	Little Canoe Cr. at I-59	33.7594	-86.4743	X			X
34	Unnamed tributary to Little Canoe Cr. at U.S. Hwy. 11, 1.8 mi. SW of Springville	33.7539	-86.4873			X	
35	Little Canoe Cr. near Weaver Pond, 3.4 mi. W of Springville on U.S. Hwy. 11	33.7368	-86.5020			X	
36	Big Canoe Cr. at Tucker property, 0.35 mi. downstream of U.S. Hwy. 11	33.8097	-86.3779	X			X
37	Big Canoe Cr. at Goodwin's Mill	33.8177	-86.3881	X	X		X
38	Big Canoe Cr. at Co. Hwy. 31, Washington Valley Rd.	33.8046	-86.4196	X	X	X	X
39	Big Canoe Cr. at Canoe Cr. Farms	33.8000	-86.4291	X			X
40	Big Canoe Cr. downstream from Co. Hwy. 9 at Morrison property	33.8082	-86.4820	X	X		X
41	Big Canoe Cr. tributary at Co. Hwy. 9	33.8041	-86.4881			X	
42	Big Canoe Cr. at Co. Hwy. 9	33.7994	-86.4885	X	X		X
43	Big Canoe Cr. at Canoe Creek Rd.	33.7935	-86.5172	X			X

Research by Gangloff (2003) included extensive sampling (qualitative and quantitative) for freshwater mussels in the Coosa River and other tributary systems and extensive searches of literature and museum data. During research for a comprehensive book on the freshwater mussels of Alabama by Williams and others (2008), considerable information was also compiled from museum and literature sources related to mussels in the Big Canoe Creek system. Between these two sources, a list of 36 species of native freshwater mussels and the Asian Clam was compiled for the Big Canoe Creek system (table 6, appendix A). Of these 36 species, 33 have been assigned conservation priority status with 10 species ranked as P5-lowest conservation concern, 5 species as low, 3 species as moderate, 9 species as high, and 6 species as P1-highest conservation concern (table 6). One of the 36 species is considered possibly extinct (*Epioblasma othcaloogensis*) and two species are considered extirpated from Alabama (*Pleurobema hanleyianum* and *Epioblasma metastriata*). Six species are afforded protection under the Endangered Species Act as endangered and two species as threatened. Twenty-seven species are considered extant in the Big Canoe Creek watershed and nine others are considered historical in occurrence, only known from records more than 25 years old.

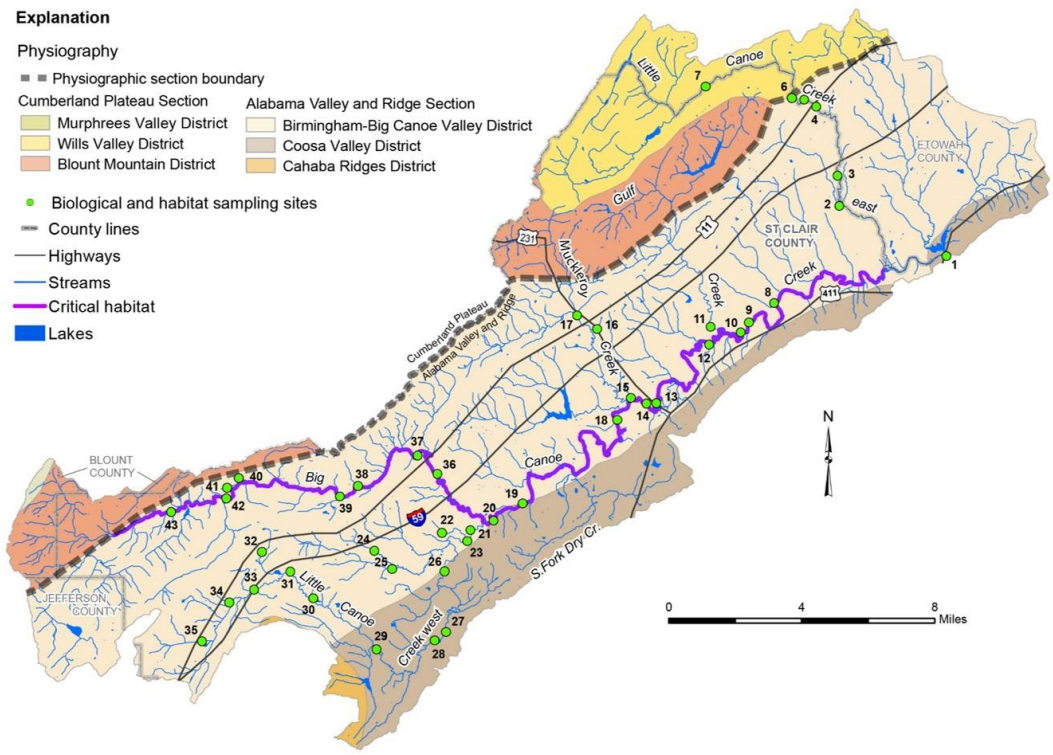


Figure 15—Biological and habitat sampling sites in the Big Canoe Creek watershed.

The presence of fresh dead shells is generally a good indication of the presence of a species whereas weathered dead shells alone may not be indicative of a viable population, as the age of death cannot be estimated with any accuracy. Twenty-four species were represented by live and(or) fresh dead shells in recent collections and three species were represented by weathered dead and(or) relic shells only. Nine species are known from the Big Canoe system only by historical records over 25 years old. These species may or may not be present in Big Canoe Creek.

The recent collection of five imperiled mussel species speaks to the health of the Big Canoe Creek system (table 6). The Finelined Pocketbook (*Hamiota altilis*) is a federally threatened and state listed P2 species and live animals and fresh dead, weathered dead, and relic shells have been collected. The Canoe Creek Clubshell (*Pleurobema athearni*), known only from Big Canoe Creek, is listed as a P1 species and has been represented recently by live animals and fresh dead and weathered dead shells (Gangloff and others, 2006). The Southern Pigtoe (*Pleurobema georgianum*) is a federally endangered and P1 species and recent collections include live animals, fresh dead, and weathered dead shells. The Rayed Kidneyshell (*Ptychobranchus foremanianus*) is a federally endangered and state P1 species and has been represented by live animals and fresh dead and weathered dead shells. The Southern Clubshell (*Pleurobema decisum*) has been represented by live animals and fresh dead and weathered dead shells. The number of individuals collected in samples over the past 20 years is also indicative of the condition of the mussel fauna. Around 64 percent of the 1,064 individuals collected were live, 25 percent were represented by fresh dead shells, 10 percent weathered dead shells, and 1 percent were relic shells.

Table 6.—Freshwater mussels collected in the Big Canoe Creek watershed.

Species name	Common name	Conservation status [1]	Recent counts [2]			
			L [3]	FD	WD	R
Amblema elliottii	Coosa Fiveridge	P3	108	19	3	
Anodonta suborbiculata	Flat Floater	P5		1		
Elliptio arca	Alabama Spike	P1		2	1	
Elliptio arctata	Delicate Spike	P2		2	4	
Elliptio crassidens	Elephantear	P4			1	
Epioblasma metastriata	Upland Combshell	EX, E	Historic records[4] only			
Epioblasma othcaloogensis	Southern Acornshell	E		3		
Fusconaia cerina	Gulf Pigtoe	P4	Historic records only			
Hamiota altilis	Finelined Pocketbook	P2, T	2	2	4	3
Lampsilis ornate	Southern Pocketbook	P5	3	5	2	
Lampsilis straminea	Southern Fatmucket	P4	Historic records only			
Lampsilis teres	Yellow Sandshell	P4		12	1	
Lasmigona etowaensis	Etowah Heelsplitter	P2	Historic records only			
Leptodea fragilis	Fragile Papershell	P5	12	26	3	
Ligumia recta,	Black Sandshell	P2		2	1	
Medionidus acutissimus	Alabama Moccasinshell	P1, T	Historic records only			
Megalonaias nervosa	Washboard	P5	1	4	2	
Obliquaria reflexa	Threehorn Wartyback	P5	1	2	1	
Obovaria unicolor	Alabama Hickorynut	P2	Historic records only			
Pleurobema athearni	Canoe Creek Clubshell	P1	7	15	3	
Pleurobema decisum	Southern Clubshell	P2, E	98	80	7	
Pleurobema georgianum	Southern Pigtoe	P1, E	1	27	9	
Pleurobema hanleyianum	Georgia Pigtoe	EX, E			3	
Ptychobranchus foremanianus	Rayed Kidneyshell	P1, E	1	3	4	1
Pyganodon grandis	Giant Floater	P5		3		
Quadrula asperata	Alabama Orb	P5		1		
Quadrula rumphiana	Ridged Mapleleaf	P3	16	4	26	5
Quadrula verrucosa	Pistolgrip	P4	420	55	9	
Strophitus connasaugaensis	Alabama Creekmussel	P2			3	1
Toxolasma corvunculus	Southern Purple Lilliput	P1	Historic records only			
Truncilla donaciformis	Fawnsfoot	P3	1			1
Utterbackia imbecillis	Paper Pondshell	P5		1		1
Villosa lienosa	Little Spectaclecase	P5	Historic records only			
Villosa nebulosi	Alabama Rainbow	P2	1		7	
Villosa umbrans	Coosa Creekshell	P2	4	5	7	1
Villosa vibex	Southern Rainbow	P5	Historic records only			

[1] Conservation status (federal and state): X–extinct, EX–extirpated, E–endangered, T–threatened; P1–Priority 1 (Highest Conservation Concern), P2–Priority 2 (High Conservation Concern), P3–Priority 3 (Moderate Conservation Concern), P4–Priority 4 (Low Conservation Concern), P5–Priority 5 (Lowest Conservation Concern).

[2] Recent collection records from Gangloff (2003), Gangloff and Feminella (2007), and GSA unpublished records.

[3] L–live, FD–fresh dead, WD–weathered dead, R–relic.

[4] Historic Records—only known from records more than 25 years old.

To date, eight species of crayfishes have been collected in Big Canoe Creek (table 7), with three species of low (P4) and four species of lowest (P5) conservation concern (Smith and others, 2011). The Greensaddle Crayfish (*Cambarus manningi*) is considered a species of high (P2) conservation concern and was found at sites 5, 6, and 41 (table 7, fig. 15, appendix B).

Table 7.—Crayfishes collected in the Big Canoe Creek watershed.

Species name	Common name	Conservation status [1]
Cambarus acanthura	Thornytail Crayfish	P4
Cambarus latimanus	Variable Crayfish	P4
Cambarus manningi	Greensaddle Crayfish	P2
Cambarus scotti	Chattooga River Crayfish	P4
Cambarus striatus	Ambiguous Crayfish	P5
Orconectes erichsonianus	Reticulate Crayfish	P5
Procambarus clarkii	Red Swamp Crawfish	P5
Procambarus spiculifer	White Tubercled Crayfish	P5

[1] Conservation status: P1–Priority 1 (Highest Conservation Concern), P2–Priority 2 (High Conservation Concern), P3–Priority 3 (Moderate Conservation Concern), P4–Priority 4 (Low Conservation Concern), P5–Priority 5 (Lowest Conservation Concern).

FISHES

Fish samples collected in the Big Canoe Creek watershed by the GSA from 2008 to 2013 (appendix C) yielded 13,144 individuals among 55 species plus a few hybrid sunfishes. Cyprinids (carps and minnows) comprised about 52 percent of the total catch and were represented by 15 species, with the Tricolor Shiner, *Cyprinella trichroistia*, the most common at 18.2 percent of the total catch (table 8). Other cyprinid species commonly found in Big Canoe Creek were the Coosa Shiner, *Notropis xaenocephalus*, at 5.7 percent; the Mountain Shiner, *Lythrurus lirus*, at 4.1 percent; and the Alabama Shiner, *Cyprinella callistia*, at 3.9 percent. Sunfishes of the family Centrarchidae were the second most abundant group at 16.1 percent of the total catch, represented by 13 species, with Longear Sunfish, *Lepomis megalotis*, and Bluegill, *L. macrochirus*, the most common at 5.2 and 3.3 percent of the total catch, respectively. Two other centrarchid species were present in moderate abundance including the Redbreast Sunfish, *L. auritus*, at 3.0 percent and the Green Sunfish, *L. cyanellus*, at 2.5 percent. Darters in the family Percidae were the third most common group collected at 15.0 percent of the total catch and represented by eight species. The Greenbreast Darter, *Etheostoma jordani*, was the most common percid species at 8.8 percent, followed by the Blackbanded Darter, *Percina nigrofasciata*, at 2.4 percent, the Speckled Darter, *E. stigmaeum*, at 1.8 percent, and the Coosa Darter, *E. coosae*, at 1.7 percent. Species diversity among stations sampled was clumped in the 20 to 30 species range with 19 samples supporting 20 to 25 species and 11 samples supporting 26 to 30 species. One sample had >30 species and four samples had <20 species (appendix C).

Table 8.—Fishes collected during surveys conducted from 2008 to 2013 by the GSA in the Big Canoe Creek watershed.

Family, *Species name*	Common name	Conservation status [1]	Total catch	Percent
Lepisosteidae—gars				
Lepisosteus oculatus	Spotted Gar	P5	1	0.01
Lepisosteus osseus	Longnose Gar	P5	1	0.01
Clupeidae—shads				
Dorosoma cepedianum	Gizzard Shad	P5	13	0.10
Dorosoma petenense	Threadfin Shad	P5	2	0.02
Cyprinidae—carps and minnows				
Campostoma oligolepis	Largescale Stoneroller	P5	1,677	12.76
Carassius auritus	Goldfish	P5	2	0.02
Cyprinella callistia	Alabama Shiner	P5	514	3.91
Cyprinella trichroistia	Tricolor Shiner	P5	2,388	18.17
Cyprinella venusta	Blacktail Shiner	P5	246	1.87
Lythrurus bellus	Pretty Shiner	P5	1	0.01
Lythrurus lirus	Mountain Shiner	P4	541	4.12
Notropis chrosomus	Rainbow Shiner	P5	234	1.78
Notropis stilbius	Silverstripe Shiner	P5	338	2.57
Notropis xaenocephalus	Coosa Shiner	P5	745	5.67
Phenacobius catostomus	Riffle Minnow	P5	101	0.77
Pimephales notatus	Bluntnose Minnow	P5	1	0.01
Pimephales promelas	Fathead Minnow	P5	3	0.02
Pimephales vigilax	Bullhead Minnow	P5	10	0.08
Semotilus atromaculatus	Creek Chub	P5	18	0.14
Catostomidae—suckers				
Hypentelium etowanum	Alabama Hog Sucker	P5	448	3.41
Minytrema melanops	Spotted Sucker	P5	7	0.05
Moxostoma duquesnei	Black Redhorse	P5	17	0.13
Moxostoma erythrurum	Golden Redhorse	P5	40	0.30
Moxostoma poecilurum	Blacktail Redhorse	P5	10	0.08
Ictaluridae—North American catfishes				
Ameiurus melas	Black Bullhead	P5	2	0.02
Ameiurus natalis	Yellow Bullhead	P5	9	0.07
Ictalurus punctatus	Channel Catfish	P5	6	0.05
Noturus leptacanthus	Speckled Madtom	P5	43	0.33
Pylodictis olivaris	Flathead Catfish	P5	1	0.01
Fundulidae—topminnows				
Fundulus olivaceus	Blackspotted Topminnow	P5	117	0.89
Fundulus stellifer	Southern Studfish	P5	65	0.49
Poeciliidae—livebearers				
Gambusia affinis	Western Mosquitofish	P5	96	0.73

[1] P2–high conservation concern; P4–low conservation concern; P5–lowest conservation concern

Table 8.—Fishes collected during surveys conducted from 2008 to 2013 by the GSA in the Big Canoe Creek watershed—**continued**.

Family, *Species name*	Common name	Conservation status [1]	Total catch	Percent
Cottidae—sculpins				
Cottus carolinae	Banded Sculpin	P5	1,343	10.22
Centrarchidae—sunfishes				
Ambloplites ariommus	Shadow Bass	P5	29	0.22
Lepomis auritus	Redbreast Sunfish	P5	392	2.98
Lepomis cyanellus	Green Sunfish	P5	325	2.47
Lepomis gulosus	Warmouth	P5	21	0.16
Lepomis macrochirus	Bluegill	P5	436	3.32
Lepomis megalotis	Longear Sunfish	P5	683	5.20
Lepomis microlophus	Redear Sunfish	P5	27	0.21
Lepomis miniatus	Redspotted Sunfish	P5	33	0.25
Micropterus coosae	Redeye Bass	P5	109	0.83
Micropterus henshalli	Alabama Bass	P5	30	0.23
Micropterus salmoides	Largemouth Bass	P5	25	0.19
Pomoxis annularis	White Crappie	P5	2	0.02
Pomoxis nigromaculatus	Black Crappie	P5	9	0.07
hybrid centrarchid			12	0.09
Percidae—darters and perches				
Etheostoma coosae	Coosa Darter	P5	220	1.67
Etheostoma ditrema	Coldwater Darter	P2	16	0.12
Etheostoma jordani	Greenbreast Darter	P5	1,151	8.76
Etheostoma stigmaeum	Speckled Darter	P5	238	1.81
Etheostoma trisella	Trispot Darter	P2	6	0.05
Percina kathae	Mobile Logperch	P5	23	0.17
Percina nigrofasciata	Blackbanded Darter	P5	309	2.35
Percina shumardi	River Darter	P5	1	0.01
Sciaenidae—drums				
Aplodinotus grunniens	Freshwater Drum	P5	7	0.05
Total		13,144	100	
Total number of species		55		

[1] P2–high conservation concern; P4–low conservation concern; P5–lowest conservation concern

All fishes collected in Big Canoe Creek are considered of lowest conservation concern (P5) in Alabama with the exception of three species. The Mountain Shiner is considered a species of low conservation concern (P4), and both the Coldwater Darter (*Etheostoma ditrema*) and the Trispot Darter (*E. trisella*) are considered species of high conservation concern (P2). The Mountain Shiner is widely distributed in the Coosa River system and can be abundant in some locations. Preferred habitat is generally small- to medium-sized clear streams with variable habitat of sand and gravel-bottomed pools, riffles, and runs. The Coldwater Darter is endemic to the middle and upper Coosa River system, inhabiting springs, spring runs, and streams, and is considered a P2 species because its preferred habitat is highly vulnerable to degradation. One form of this species prefers stream habitat in the central Coosa River while the other form prefers spring habitat from about Coldwater

Spring upstream into Georgia. Spring habitat of the Coldwater Darter is highly vulnerable to degradation from development while its stream habitat is continually facing challenges from nonpoint source pollution. The Trispot Darter is considered a P2 species because of its restricted distribution in Alabama and total range in the southeast. The Trispot Darter is currently under review by the USFWS for listing under the Endangered Species Act. Johnson and others (2013) completed a three-year survey for the Trispot Darter in Alabama and a summary of their findings is presented below.

TRISPOT DARTER STATUS IN ALABAMA

In October 2008, the Trispot Darter was rediscovered in Alabama while sampling in the Big Canoe Creek system. It had been over 50 years since the last known individual was collected in the state, with only two specimens ever known from Alabama. The Trispot Darter was described by Bailey and Richards (1963) from one individual collected in Cowans Creek, a small Coosa River tributary in Cherokee County, Alabama, in 1947. The type locality was inundated by Weiss Reservoir in 1960. The second specimen was collected in 1958 by Jack Dendy of Auburn University in the main stem of the Coosa River in Etowah County (Ramsey, 1976). That locality was inundated by H. Neely Henry Lake in 1965. Attempts to collect the species in appropriate habitat throughout the upper Coosa River system in Alabama since the discovery of the first two individuals, including an intensive survey for the species (Neely and Mayden, 1999), failed to produce additional specimens (Mettee and others, 1996; Boschung and Mayden, 2004; Warren, 2004). Due to the perceived elimination of habitat by impoundment, effects of polluted runoff in rural areas of the upper Coosa Valley in Alabama, and the lengthy absence of collection records in the state, the species was presumed to be extirpated from Alabama (Warren, 2004). While conducting biological assessments for this report, three individuals were captured in Little Canoe Creek (west) near Springville, St. Clair County, on October 30, 2008.

Subsequent survey work after rediscovery (Johnson and others, 2013) found Trispot Darters throughout the lower reaches of Little Canoe Creek (west) and in one other tributary to the Coosa River, Ball Play Creek. In Little Canoe Creek (west), the Trispot Darter was collected at 35 stations (fig. 16). Three significant breeding areas in the Little Canoe Creek (west) subwatershed have been identified at this time: Gin Branch, an unnamed tributary to Little Canoe Creek on Alabama Power Company (APCO) property, and Little Canoe Creek near the St. Clair County Correctional Facility. Spawning is likely not restricted to these three areas and will occur in small off-channel seeps and seasonally wet tributaries wherever acceptable breeding habitat occurs.

The Trispot Darter is not federally listed; however, it is listed as endangered in the most recent list of imperiled freshwater and diadromous fishes of North America by the Endangered Species Committee of the American Fisheries Society (AFS) (Jelks and others, 2008). This listing is an elevation from threatened status in the previous 1989 AFS list (Williams and others, 1989). Reasons for listing the species were stated as the destruction, modification, and reduction of its habitat and a narrowly restricted range. The species is listed as endangered by the state of Georgia (Georgia Department of Natural Resources, 2006) and threatened by the state of Tennessee (Withers, 2009).

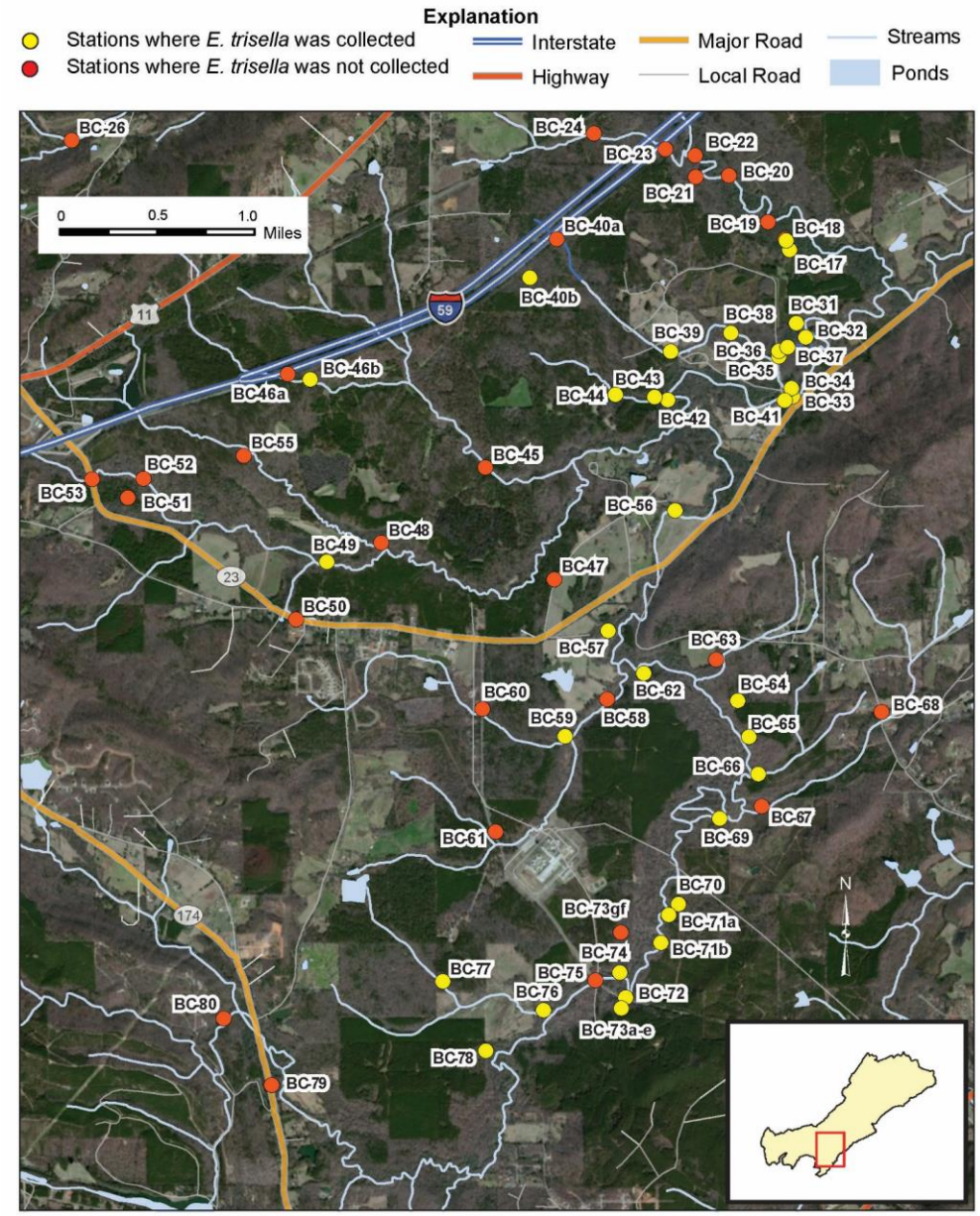


Figure 16.—Trispot Darter sampling sites in the Little Canoe Creek (west) subwatershed of the Big Canoe Creek watershed. Inset map at bottom right displays the location of the sample sites in the Big Canoe Creek watershed. Station numbers are defined in Johnson and others (2013).

BIOLOGICAL CONDITION

The science and practice of stream monitoring, assessment, and evaluation has grown substantially since passage of the Clean Water Act in 1972. Biological and habitat assessment methods have been added to the traditional chemical and physical measurements of stream water quality, and water resource and fisheries management professionals now have an expanded and enhanced toolbox for evaluating water resource conditions. Biological assessment methods incorporate a variety of taxonomic groups

including algae, benthic macroinvertebrates, and fishes, all of which reflect stream water quality through the composition, structure, and functional relationships of their biological communities (Barbour and others, 1999). In particular, the Index of Biotic Integrity (IBI) method, based on the fish community (Karr, 1981), has proven to be an effective tool for evaluating stream health and in some states to provide a scientifically credible basis for numerically regulating and managing stream water quality.

In Alabama, the IBI has been used by the Tennessee Valley Authority (TVA) throughout the Tennessee River basin since 1986 (Saylor and Ahlstedt, 1990) to evaluate stream biological conditions. The IBI has also been used by GSA to assess biological conditions in the upper Cahaba River system (Shepard and others, 1997), lower Cahaba River system (O'Neil and Shepard, 2000a), the upper Black Warrior River system (O'Neil and Shepard, 2000b; Shepard and others, 2002; Shepard and others, 2004), Hatchet Creek (O'Neil and Shepard, 2004), Choccolocco Creek (O'Neil and Chandler, 2005), and the Choctawhatchee-Pea River system (Cook and O'Neil, 2000). ADEM also uses the IBI for stream screening assessments in their water-quality monitoring activities.

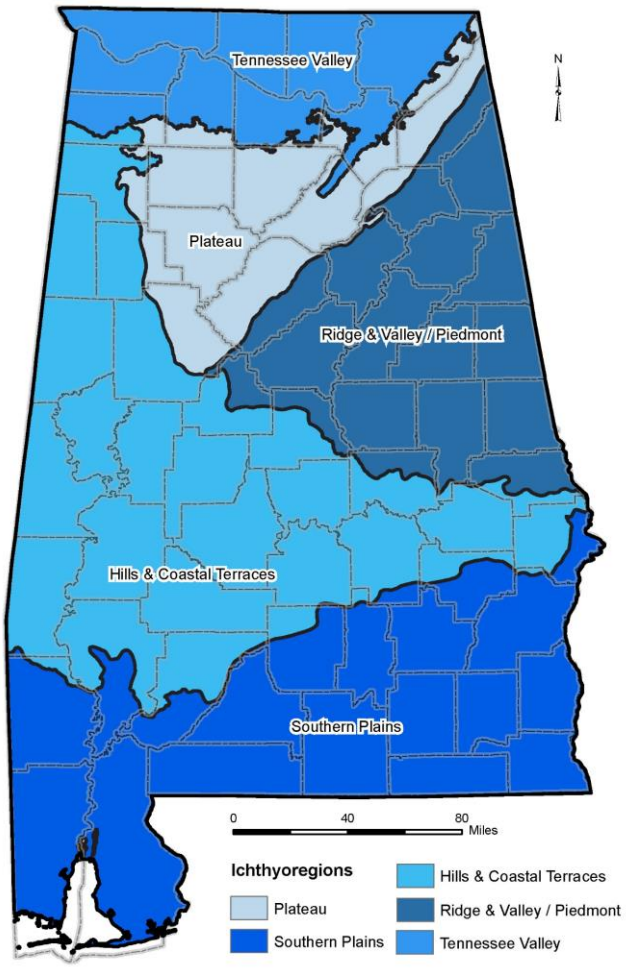


Figure 17.—Ichthyoregions of Alabama.

Standardized stream fish sampling protocols have been defined (O'Neil and others, 2006) and the IBI has been calibrated to Alabama's five unique ichthyoregions (fig. 17) (O'Neil and Shepard, 2007) including the Tennessee Valley (O'Neil and Shepard, 2010), Ridge and Valley/Piedmont (O'Neil and Shepard, 2011a), Plateau (O'Neil and Shepard, 2011b), Hills and Coastal Terraces (O'Neil and Shepard, 2011c), and Southern Plains (O'Neil and Shepard, 2012). The standardized sampling protocol recommends that sampling should be stratified over four basic stream habitat types (riffles, runs, pools, and shorelines). A minimum of 10 sampling efforts each should be completed in riffle, run, and pool habitats and two sampling efforts should be completed along stream shorelines. This level of sampling effort and

intensity, termed the “30+2" method, was determined sufficient to yield a fish community sample acceptable for calculating IBIs. Within the 30+2 IBI sampling method, small-mesh minnow seines serve as a complement to the backpack electroshocker and are used to catch, scoop, or dip stunned fishes and to trap fishes in sloughs and backwaters. At other times, seines are used as the primary device for capturing fishes in pools and runs and along shoals.

From 2008 to 2013, GSA determined stream biological condition during 34 fish community assessments at 23 sites in Big Canoe Creek (table 5, fig. 18), utilizing methods described in O’Neil and Shepard (2011a) (table 9). Two to three samples were taken at eight of these sites during this time period. Four assessments at three sites (10, 11, and 18) rated poor, 11 assessments at 9 sites rated fair, 16 assessments at 13 sites rated good, and assessments at three sites rated excellent (25, 38, and 42) (table 9, fig. 18). The IBI varies seasonally, reflecting natural fish community changes due to reproduction cycles, population recruitment and growth, and climate-related flood and drought cycles. As such, several samples should ideally be collected from different seasons to adequately characterize the statistical distribution of IBIs at any one site.

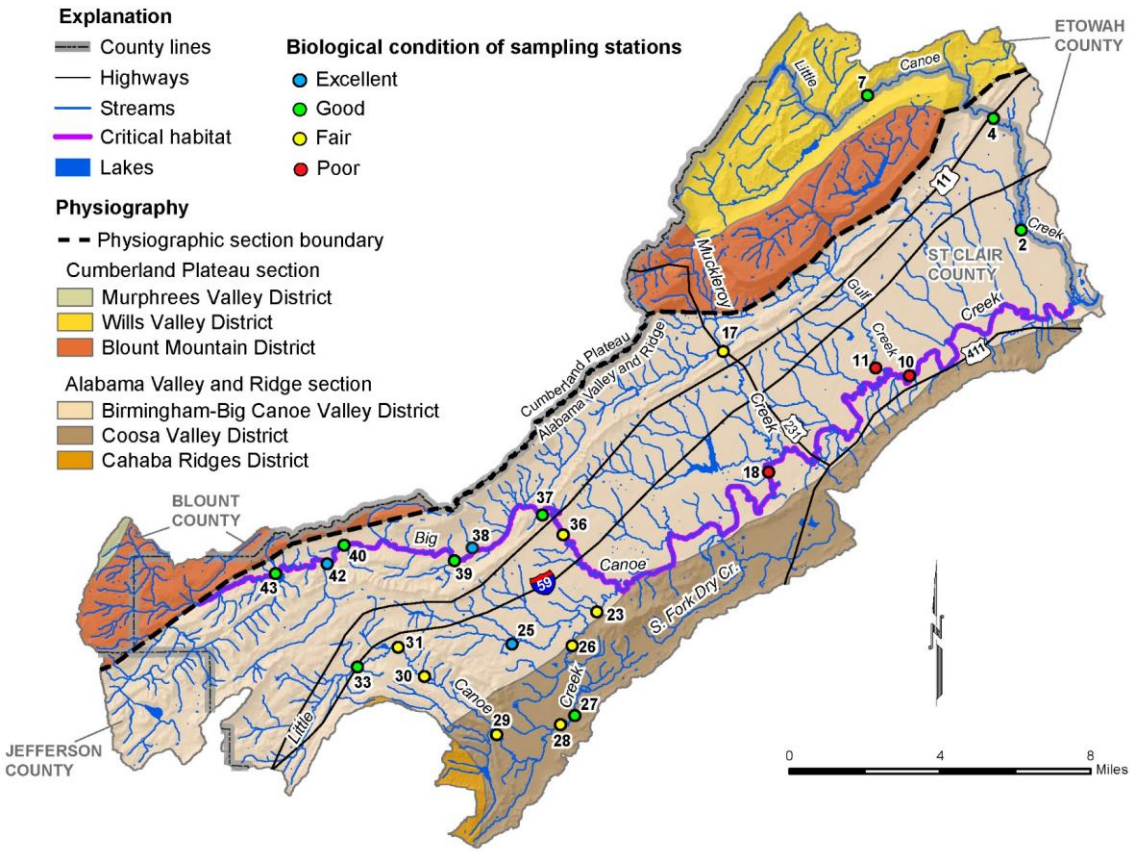


Figure 18 —Biological condition at sampling sites in the Big Canoe Creek watershed.

Table 9.—Index of Biotic Integrity (IBI) scores for sites in the Big Canoe Creek watershed. See figure 18 for site locations.

Total native species	1	% Omnivores	8
Number shiner species	2	% Insectivorous cyprinids	9
Number Lepomis species	3	% Top piscivores	10
Number darter + madtom species	4	% Anomalies + hybrids	11
Number intolerant species (total)	5	% Simple spawners	12
% Tolerant	6	IBI score	13
% *Lepomis*	7	Biological condition[1]	14

Site No.	GSA No.	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	1248	14-Jun-12	3	3	5	3	3	5	3	5	3	3	5	3	44	G
4	2753	29-Sep-04	3	3	5	5	3	5	3	3	3	3	5	3	44	G
	2075	25-Jun-09	3	1	5	5	5	5	3	5	3	3	3	3	44	G
	1231	13-Jun-12	3	3	5	5	3	5	3	5	3	5	1	3	44	G
7	1236	13-Jun-12	1	1	3	3	3	5	5	5	3	5	5	5	44	G
10	1249	20-Jun-12	3	1	3	3	3	3	3	3	1	5	1	3	32	P
11	1250	20-Jun-12	3	1	5	3	1	5	1	3	1	5	1	1	30	P
17	1240	13-Jun-12	3	3	5	3	3	3	1	5	1	5	5	1	38	F
18	2195	30-Oct-08	3	1	1	3	3	5	3	3	1	3	1	3	30	P
	2074	26-Jun-09	3	3	3	3	3	5	3	5	1	5	3	1	38	F
	1239	13-Jun-12	3	1	3	3	3	5	5	3	1	1	1	1	30	P
23	2194	30-Oct-08	3	3	5	5	3	5	5	5	3	3	1	5	46	G
	2078	25-Jun-09	3	3	3	5	5	5	3	3	1	3	5	1	40	F
	1230	13-Jun-12	3	3	3	5	3	5	3	5	1	1	5	3	40	F
25	1254	12-Jun-12	5	5	5	5	5	5	5	5	5	1	5	5	56	E
26	1235	11-Jun-12	3	3	5	3	3	5	3	3	1	3	1	3	36	F
27	1229	11-Jun-12	5	3	5	5	5	5	3	5	1	1	5	3	46	G
28	2073	26-Jun-09	3	3	3	5	5	3	3	5	1	1	5	3	40	F
29	2081	30-Jun-09	3	3	5	5	3	5	3	5	1	3	5	3	44	G
	1232	12-Jun-12	5	3	5	5	3	3	3	3	1	5	3	1	40	F
30	1975	06-May-10	5	3	5	3	3	3	1	5	1	5	1	3	38	F
31	1233	12-Jun-12	5	3	5	3	3	3	3	5	1	5	5	1	42	F
33	1228	12-Jun-12	5	5	5	5	5	3	3	3	1	3	5	1	44	G
36	1803	27-May-10	3	3	3	5	3	5	3	5	1	5	5	1	42	F
	1234	13-Jun-12	5	3	5	3	3	5	3	1	1	3	5	1	38	F
37	1185	15-May-13	3	3	3	3	3	5	3	5	5	3	5	5	46	G
	1184	15-May-13	3	5	3	3	5	5	3	5	1	3	5	3	44	G
38	2079	30-Jun-09	3	5	5	3	3	5	5	5	5	3	5	5	52	E
	1238	11-Jun-12	3	5	3	3	5	5	5	5	3	3	5	5	50	G
39	1237	14-Jun-12	3	5	3	3	5	5	5	5	3	3	5	5	50	G
40	1244	12-Jun-12	3	5	3	3	5	5	5	5	3	3	5	3	48	G
42	2080	30-Jun-09	3	5	5	5	5	5	3	5	3	1	5	3	48	G
	1242	12-Jun-12	3	5	3	5	5	5	5	5	5	3	5	3	52	E
43	1243	12-Jun-12	3	5	3	5	5	5	5	3	3	3	5	1	46	G

[1]Excellent—E, Good—G, Fair—F, Poor—P

RAPID HABITAT ASSESSMENT

Habitat evaluations are an integral part of efforts to describe stream biological condition because good biological condition is quite often predicated on the presence of stable and diverse habitat. The term habitat, as applied herein, incorporates several features and processes in streams including the physical components such as rock and rubble, logs, mud, channel, and substrate condition; the chemical and physical components of water quality such as pH, dissolved chemical constituents, temperature, and dissolved gases; and flow components such as flood and drought frequencies, velocity regimes, and discharge. For quantitative assessment, the habitat concept is generally narrowed to include the physical components of habitat and substrate structure, the degree of channel alteration, and the condition of banks and the adjacent riparian corridor. All of these components directly affect the structure and function of the aquatic biological community and they can be visually assessed for quality and relative degree of impairment. The visual glide-pool (G-P) and riffle-run (R-R) assessment procedures used in this study to quantify habitat conditions were originally reported in Plafkin and others (1989) and modified by Barbour and others (1999).

Stream habitat assessments entail evaluating the structure of the surrounding physical habitat that influences water resource quality and thus the condition of the resident biological community (Barbour and others, 1999). Generally, three characteristics of habitat contribute to the maintenance and persistence of aquatic biological communities: the availability and quality of the habitat-substrate components and instream cover, morphology of the instream channel, and structure of the bank and riparian vegetation zone (Plafkin and others, 1989). Barbour and others (1999) developed two sets of habitat metrics, one for evaluating upland stream habitat dominated by R-R microhabitats and hard substrates, and the other for evaluating lowland and Coastal Plain streams that are dominated by G-P and run-pool habitats with unconsolidated sandy substrates (appendix D).

The 11 habitat metrics of the G-P index and 12 metrics of the R-R index are individually scored on a scale of 0 (poor quality) to 20 (optimal quality) and are then summed to give a final score. The maximum possible habitat score is 220 for the G-P method and 240 for the R-R method. Final habitat scores are sometimes compared to reference streams that are minimally or least impaired in the area. Habitat quality is also sometimes taken as a percentage of the maximum habitat score possible. The percent maximum habitat score method was adopted for this study. Habitat metrics included in the rapid habitat assessment fall into three categories: habitat and substrate, instream channel morphology, and bank and riparian vegetative structure and quality.

HABITAT AND SUBSTRATE METRICS

Instream cover (R-R and G-P)—This habitat metric refers to the quantity and variety of natural substrate features such as fallen trees, logs, branches, undercut banks, and hard substrate particles that aquatic organisms can use as refugia, feeding sites, or for spawning. A diversity of substrate objects and microhabitat types leads to a diverse and productive aquatic community and, hence, a good biological condition. The presence of clean gravel,

cobble, and log snags in flowing streams is generally desirable. However, other objects such as tree roots, aquatic vegetation, and undercut banks provide habitat for many species.

Epifaunal surface (R-R)—This parameter evaluates the relative amount and types of natural structures in the stream like cobble, boulders, trees, logs and branches, and undercut banks which serve as places for spawning and habitat for aquatic macroinvertebrates and fishes. As variety and abundance of structures decrease, habitat structure becomes simplified and biodiversity will decrease.

Embeddedness (R-R)—Embeddedness is a measure of the relative degree to which rocks and snags are covered with silt, sand, and (or) mud. As substrate features become buried, the available high-quality surfaces for shelter, spawning, and feeding decrease, resulting in reduced biodiversity.

Velocity/depth regimes (R-R)—High-quality riffle-run streams generally have four velocity/depth regimes present: slow-deep, slow-shallow, fast-deep, and fast-shallow. The presence of these regimes relates to the stream's ability to support stable aquatic habitat and reflects the degree of geomorphic stability.

Pool substrate characterization (G-P)—Evaluates the type and condition of bottom substrates in pools. Firm substrates, like gravel and sand, and aquatic vegetation generally support a greater variety of aquatic organisms compared to pools with unconsolidated mud, bedrock, and silt with no aquatic vegetation.

Pool variability (G-P)—This metric evaluates the overall mixture of pool types in the stream relative to size and depth. Pools of variable sizes and depths (large-deep, large-shallow, small-deep, and small-shallow) are preferable to pools of uniform depth (small or large-shallow) because they will generally support a greater variety of organisms. Extreme bedload sedimentation will lead to pools of uniform width and depth which strongly impairs aquatic biodiversity.

INSTREAM CHANNEL MORPHOLOGY METRICS

Man-made channel alteration (R-R and G-P)—This metric quantifies the degree of channel alteration, usually in the form of stream channelization. Channelization changes the fundamental hydrodynamic and energy-flow relationships of a stream resulting in bank erosion and habitat degradation. Channel alteration can result in deposition where stream gradient flattens, on the inside of bends, and below channel constrictions. Channelization decreases stream sinuosity, thereby increasing velocities and the potential for channel and bank scour and possibly accelerated downcutting of the channel.

Sediment deposition (R-R and G-P)—This characteristic quantifies the amount of sediment in pools and the changes that have taken place on stream bottoms from processes of erosion and sedimentation. The character of sediment deposits is an indication of the severity of watershed erosion, bank erosion, and stability of the streambed. Sediment deposits appear and increase in coverage with continual upstream erosion in the watershed.

Frequency of riffles (R-R)—Riffles are high-quality habitat in upland streams and this parameter assesses the heterogeneity and occurrence of riffles in a stream. More riffle habitat generally results in a greater variety and abundance of aquatic organisms.

Channel flow status (R-R and G-P)—The degree to which a channel is filled with water is important because as flow volume decreases, the amount of suitable substrate for aquatic organisms also decreases and biological condition can degrade. Having a suitable amount of submerged area and volume of flow is also important for maintaining acceptable water quality.

Channel sinuosity (G-P)—Streams with a higher degree of sinuosity provide greater habitat diversity and more opportunities for the stream to support a varied fauna. Streams with sinuous channels are also better structured geomorphologically to hydraulically attenuate floods and storm flows by dissipating energy and protecting banks from excessive erosion.

BANK AND RIPARIAN VEGETATIVE STRUCTURE METRICS

Condition of banks (R-R and G-P)—Bank stability accounts for the condition of the banks and their potential for erosion. Steep banks are more likely to collapse and more prone to erosion than gently sloping banks. Crumbling and unvegetated banks, exposed tree roots, and exposed soil are signs of accelerated bank erosion.

Bank vegetative protection (R-R and G-P)—This metric is an evaluation of the vegetative protection on stream banks and the near-stream portion of the riparian zone. Roots hold soil in place and reduce erosion potential thus enhancing the local aquatic biological community.

Grazing or other disruptive pressure (R-R and G-P)—The degree to which streamside cover has been removed by animal grazing, mowing or herbicides, and mechanical tree removal is evaluated for this metric. Streams with natural vegetative cover have been shown to have a higher standing crop and variety of organisms compared to streams that are routinely disrupted or managed through mowing and grazing.

Riparian vegetative zone width (R-R and G-P)—The riparian zone serves to buffer the stream from runoff, controls erosion, and provides organic matter and nutrients to the stream. Undisturbed riparian zones with natural vegetation help maintain highly diverse and functional aquatic communities, while narrow and impaired riparian zones yield poor biological conditions and are associated with roads, fields, parking lots, and lawns. Three of the R-R habitat assessment metrics vary from the G-P metrics and R-R also includes one additional metric to capture the character of streams with hard, rocky substrates and their associated flow-stream depth regimes.

SURVEY RESULTS

A rapid habitat assessment survey was completed at each IBI sampling station in Big Canoe Creek (table 10, fig. 18). Habitat quality varied from poor to optimal, with 10 sites in the optimal range (>75 percent of the maximum habitat score), 11 sites in the suboptimal range (65 to 75 percent of the maximum habitat score), and 13 sites in the marginal to poor range (<65 percent of the maximum habitat score) (fig. 19). Six of the 13 marginal to poor evaluations were from the Little Canoe Creek (west) watershed near Springville; four were from the main channel of Big Canoe Creek; two from Little Canoe Creek (east) near Steele; and one from Muckleroy Creek.

Table 10.—Rapid Habitat Assessment metrics and scores for sites in the Big Canoe Creek watershed.
See figure 18 for site locations.

Site number	2	4	4	4	7	10
GSA number	1248	1231	2753	2075	1236	1249
Date	6/14/12	6/13/12	9/29/04	6/25/09	6/13/12	6/20/12
Instream cover	17	18	9	12	18	14
Epifaunal surface	13	16	11	13	17	12
Embeddedness	16	16	6	10	15	13
Velocity/depth	15	18	13	13	15	14
Man-made channel alteration	18	17	16	9	18	14
Sediment deposition	16	16	4	10	14	13
Riffle frequency	11	16	15	8	17	10
Channel status	18	18	16	9	15	16
Bank condition	16	16	3	10	18	10
Bank vegetation	18	16	10	13	18	14
Disruptive pressure	12	15	16	13	20	16
Riparian vegetation	14	13	13	8	20	14
Pool substrate characterization	--	--	--	--	--	--
Pool variability	--	--	--	--	--	--
Channel sinuosity	--	--	--	--	--	--
Total habitat score	184	195	132	128	205	160
Percent maximum habitat score	77	81	55	53	85	67
Habitat condition	O	O	M	M	O	S

Site number	11	17	18	18	18	23
GSA number	1250	1240	1239	2195	2074	1230
Date	6/20/12	6/13/12	6/13/12	10/30/08	6/26/09	6/13/12
Instream cover	15	10	15	15	11	16
Epifaunal surface	--	4	14	16	9	16
Embeddedness	--	4	11	11	12	13
Velocity/depth	--	8	16	17	11	15
Man-made channel alteration	17	15	20	12	10	16
Sediment deposition	12	9	12	7	9	12
Riffle frequency	--	0	18	16	8	14
Channel status	16	10	18	12	10	16
Bank condition	10	11	12	12	8	12
Bank vegetation	13	12	14	10	9	13
Disruptive pressure	18	10	14	18	11	14
Riparian vegetation	19	8	17	14	10	12
Pool substrate characterization	16	--	--	--	--	--
Pool variability	14	--	--	--	--	--
Channel sinuosity	16	--	--	--	--	--
Total habitat score	166	101	181	160	118	169
Percent maximum habitat score	75	42	75	67	49	70
Habitat condition	S	P	S	S	P	S

[a]Abbreviations: O-optimal, S-suboptimal, M-marginal, P-poor

Table 10.—Rapid Habitat Assessment metrics and scores for sites in the Big Canoe Creek watershed—**continued**.
See figure 18 for site locations.

Site number	23	23	25	26	27	28
GSA number	2194	2078	1254	1235	1229	2073
Date	10/30/08	6/25/09	6/12/12	6/11/12	6/11/12	6/26/09
Instream cover	9	11	16	14	14	11
Epifaunal surface	12	10	17	16	14	10
Embeddedness	11	10	16	15	14	12
Velocity/depth	9	9	15	16	15	10
Man-made channel alteration	12	8	18	18	16	14
Sediment deposition	9	11	13	18	12	11
Riffle frequency	5	9	14	12	11	10
Channel status	16	10	18	18	18	13
Bank condition	12	11	14	10	15	12
Bank vegetation	13	12	15	15	15	13
Disruptive pressure	20	10	18	15	17	13
Riparian vegetation	13	10	18	14	18	12
Pool substrate characterization	--	--	--	--	--	--
Pool variability	--	--	--	--	--	--
Channel sinuosity	--	--	--	--	--	--
Total habitat score	141	121	192	181	179	141
Percent maximum habitat score	59	50	80	75	75	59
Habitat condition	M	M	O	S	S	M

Site number	29	29	30	31	33	36
GSA number	1232	2081	1975	1233	1228	1803
Date	6/12/12	6/30/09	5/16/10	6/12/12	6/12/12	5/27/10
Instream cover	14	6	6	14	13	14
Epifaunal surface	14	10	6	14	14	15
Embeddedness	12	5	5	10	10	12
Velocity/depth	16	8	12	12	14	16
Man-made channel alteration	16	13	15	14	14	14
Sediment deposition	14	6	4	10	10	11
Riffle frequency	14	4	8	10	12	12
Channel status	14	17	17	16	16	14`
Bank condition	14	11	10	9	15	11
Bank vegetation	17	12	12	13	16	12
Disruptive pressure	17	18	12	16	15	12
Riparian vegetation	17	16	9	16	16	8
Pool substrate characterization	--	--	--	--	--	--
Pool variability	--	--	--	--	--	--
Channel sinuosity	--	--	--	--	--	--
Total habitat score	179	126	116	153	165	151
Percent maximum habitat score	75	53	48	64	69	63
Habitat condition	S	M	P	M	S	M

[a]Abbreviations: O-optimal, S-suboptimal, M-marginal, P-poor

Table 10.—Rapid Habitat Assessment metrics and scores for sites in the Big Canoe Creek watershed—**continued**.
See figure 18 for site locations.

Site number	36	37	37	38	38
GSA number	1234	1184	1185	1238	2079
Date	6/13/12	5/15/13	5/15/13	6/11/12	6/30/09
Instream cover	12	18	12	16	16
Epifaunal surface	14	18	10	16	16
Embeddedness	10	16	9	16	15
Velocity/depth	17	18	8	18	14
Man-made channel alteration	15	17	16	18	19
Sediment deposition	12	15	4	16	16
Riffle frequency	11	17	4	14	13
Channel status	16	19	18	16	17
Bank condition	10	17	16	15	15
Bank vegetation	12	18	14	14	16
Disruptive pressure	10	17	18	12	14
Riparian vegetation	10	17	18	12	10
Pool substrate characterization	--	--	--	--	--
Pool variability	--	--	--	--	--
Channel sinuosity	--	--	--	--	--
Total habitat score	149	207	147	183	181
Percent maximum habitat score	62	86	61	76	75
Habitat condition	M	O	M	O	S

Site number	39	40	42	42	43
GSA number	1237	1244	1242	2080	1243
Date	6/14/12	6/12/12	6/12/12	6/30/09	6/12/12
Instream cover	17	16	17	17	17
Epifaunal surface	18	17	16	16	14
Embeddedness	16	17	15	18	16
Velocity/depth	16	16	17	12	16
Man-made channel alteration	17	18	19	16	18
Sediment deposition	15	16	15	14	14
Riffle frequency	13	15	14	17	13
1Channel status	18	18	17	18	18
Bank condition	14	8	17	12	18
Bank vegetation	18	14	18	16	18
Disruptive pressure	14	14	16	18	16
Riparian vegetation	15	12	18	18	18
Pool substrate characterization	--	--	--	--	--
Pool variability	--	--	--	--	--
Channel sinuosity	--	--	--	--	--
Total habitat score	191	181	199	192	196
Percent maximum habitat score	80	75	83	80	82
Habitat condition	O	S	O	O	O

[a]Abbreviations: O-optimal, S-suboptimal, M-marginal, P-poor

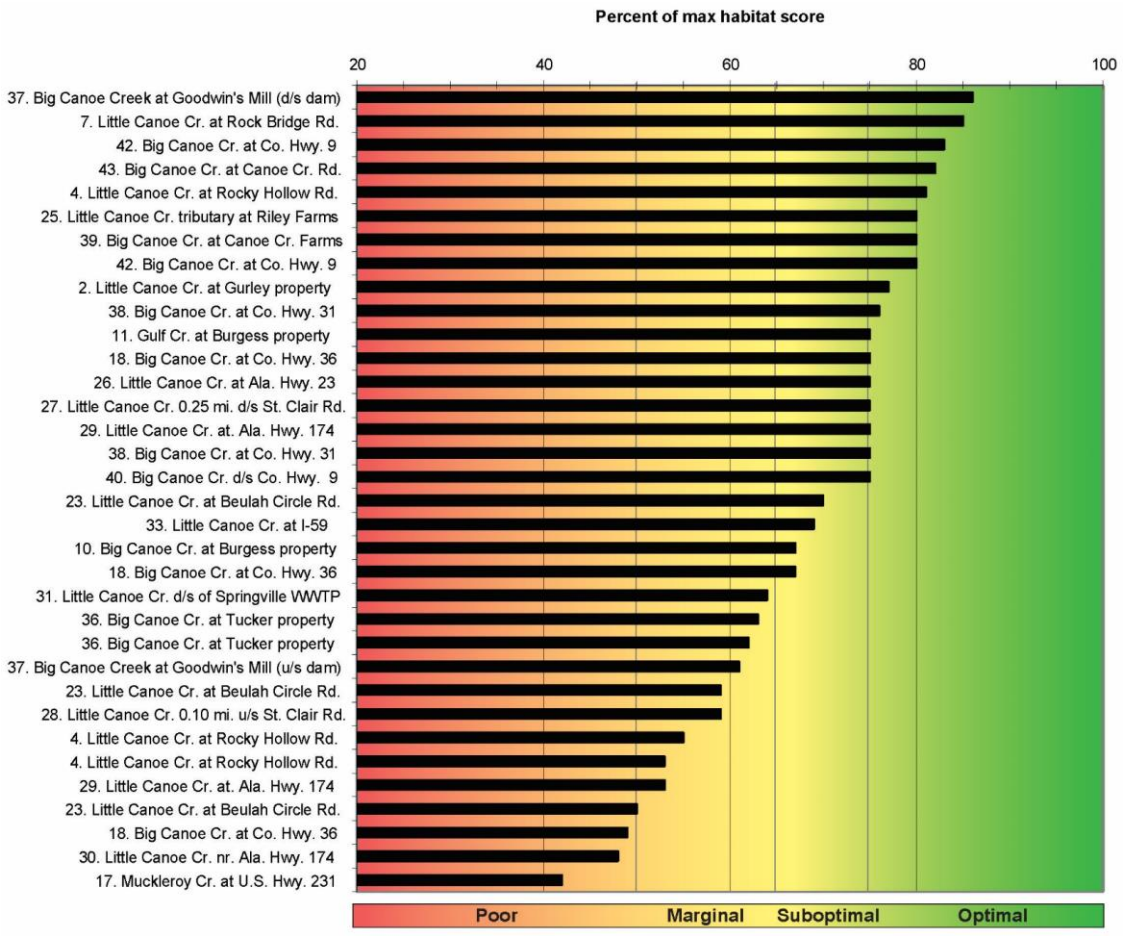


Figure 19.—Percent of max habitat scores for sites in the Big Canoe Creek watershed, 2004 to 2012. Sites are arranged from highest to lowest with some sites having multiple evaluations.

The six evaluations in Little Canoe Creek (west) near Springville represent the generally altered habitat conditions in this subwatershed. Average or lower scores were recorded for the following metrics: instream cover, embeddedness, velocity/depth regimes, sediment deposition, and riffle frequency. Pool habitat with sand/silt bedload frequently occurs in Little Canoe Creek (west), which tends to smother cobble shoals. Bedload sediment appears to be derived from development along Ala. Hwy. 174 close to Little Canoe Creek (west) and in the extreme headwaters close to I-59. Habitat in lower Little Canoe Creek (east) near Steele also rated marginal. This high-gradient stream runs parallel to Rocky Hollow Road for some distance with poor bank condition and sediment deposition noted as problems.

Big Canoe Creek at St. Clair Co. Hwy. 36 (site 18) was variable, ranging from poor to optimal. Habitat had low to average marks for embeddedness, sediment deposition, and bank vegetative cover. Big Canoe Creek downstream of U.S. Hwy. 11 (site 36) scored in the marginal range, with low scores for bank condition and riparian vegetative cover. About half of this site had good riparian cover and the other half had no riparian cover with poor

bank quality. Big Canoe Creek upstream of Goodwin's Mill Dam (site 37) scored marginal, with low scores for embeddedness, velocity/depth regime, sediment deposition, and riffle frequency. For many years this site was a small impoundment which accumulated sediment that covered all natural habitat features. Following the removal of the dam in 2013, this reach began to restore itself to a higher quality stream habitat. Muckleroy Creek at U.S. Hwy. 231 (site 17) scored the lowest of all sites in this study. Eleven of the 12 habitat metrics scored in the average range (8-12) or lower. This is a pooled site with no riffle habitat, high embeddedness of the natural cobbles, high sediment deposition, poor instream cover, and generally poor bank and riparian quality.

SEDIMENTATION RISK INDEX

Sedimentation risk at stream crossings was evaluated in Big Canoe Creek using the sedimentation risk index (SRI) methodology developed by Witmer and others (2009). The SRI is an index calculated from 12 unique measurements (metrics) that consider the condition of the stream channel upstream and downstream of the crossing structure, condition of the crossing structure, potential volume of road sediment available for transport to the stream, and the condition of ditches and outlets draining the road and entering the stream near the crossing structure (table 11). A field worksheet (appendix D) is used to score a stream's SRI on-site using the metrics identified by Witmer and others (2009) as modified for the inclusion of paved roads.

Each metric is scored either 1 (poor condition), 3 (fair condition), or 5 (good condition) based on a specified set of criteria for each metric (appendix E). The 12 metric scores are then added together to yield the SRI. Sites with SRI scores from 46 to 60 are at low risk for sedimentation, 37 to 45 at moderate risk, and 12 to 36 are at high risk for sedimentation. Although Witmer and others (2009) created the SRI tool for unpaved roads, we have applied it universally to paved roads as well to capture stream crossing and ditch/outlet features that may be contributing sediment to the receiving stream or serving as fish barriers. A standard set of digital photos are taken at each crossing to visually document stream and crossing conditions at the time of evaluation.

Table 11.—Sedimentation Risk Index metrics (Witmer and others, 2009).

SRI evaluation categories	SRI metric
Waterway condition	1. Upstream (u/s) channel morphology
	2. Downstream (d/s) channel morphology
	3. Downstream channel/bank alteration
Crossing structure condition	4. Upstream culvert skew angle
	5. Crossing fill condition
	6. Crossing inlet/outlet condition
Road approaches I	7. Potential eroded volume of sediment from the road surface
	8. Soil type and erodibility
	9. Road approach slope
	10. Road approach surface material
Road approaches II	11. Condition of the four drainage ditch outlets to streams
	12. Condition of the four ditches draining to streams

WATERWAY METRICS

The upstream (u/s) and downstream (d/s) channel morphology (metrics 1 and 2) are characterized using the Rosgen Level I stream classification (fig. 20) (Rosgen, 1996) to classify channels visually as either stable or not stable. Stream classes A, B, C, and E are considered indicative of stable channels (score 5) not severely impacted by road crossings. Waterways that are dammed by beavers, or a class DA, are scored 3 (moderately stable) and waterways that were ponded or class D, F, or G are scored 1 (unstable channels). Downstream channel/bank alteration (metric 3) scores 5 if little evidence of bank erosion or channel alteration is present, 3 if only minor or partial alterations are evident, and 1 if stream channels are highly modified. Altered channels can be highly incised and lack significant vegetative cover.

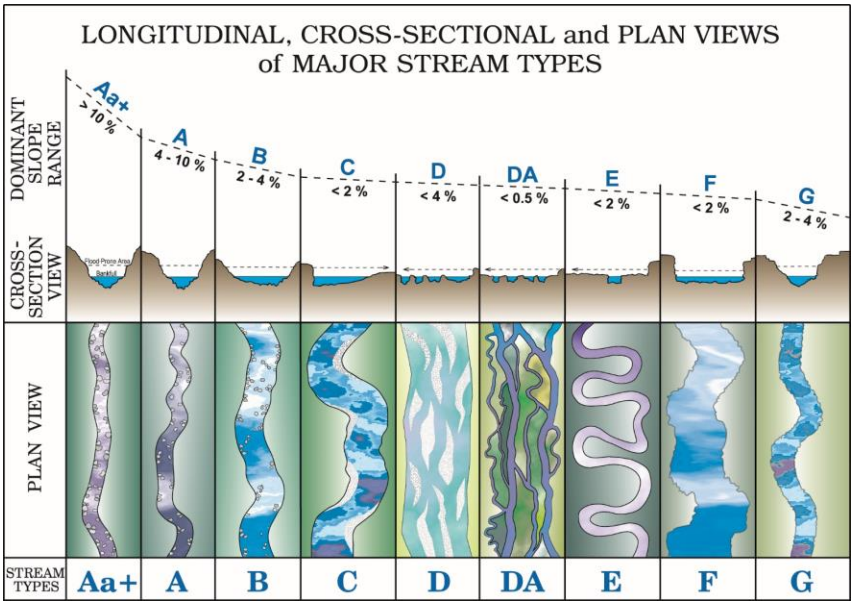


Figure 20.—The Rosgen Level 1 stream classification system (Rosgen, 1996).

CROSSING STRUCTURE METRICS

Upstream culvert skew angle (metric 4) is a measure of the degree of misalignment between the crossing span and the direction of flow in the culvert. Improperly aligned culverts contribute to scour and erosion around the structure (fig. 21). Culverts offset at an angle >30° score 1, angles between 5° and 30° score 3, and angles <5° score 5. If no culverts are present, this metric scores 5.

Condition of the crossing fill (metric 5) characterizes the fill material supporting and surrounding the crossing structure. For culverts the fill material encompasses most of the crossing, while for bridges and box culverts the fill encompasses primarily wing walls and abutments. Good fill conditions that show little to no erosion, are well vegetated, or contain well maintained riprap receive a score of 5. Fill conditions showing signs of erosion, poorly maintained riprap, and incomplete vegetation score 3. Bare soil fill with no

vegetation, significant erosion taking place, or undercutting of the structure score 1 (fig. 22).

The crossing inlet/outlet condition (metric 6) evaluates impacts to the crossing structure in the immediate reach both upstream and downstream of the structure. If the inlet/outlet is blocked 80 percent or greater due to crushing or accumulated debris, this metric scores 1 (fig. 23). Inlets/outlets with sediment islands or structure-induced scouring score 3, and structures with little flow reduction or blockage score 5.

ROAD APPROACHES I METRICS—POTENTIAL ROAD SEDIMENT

Metric 7 is the potential eroded volume of sediment that may be transported during a rain event from the unpaved road surface. The basic formula for calculation of one

Figure 21.—Example of upstream skew angle >30° (Witmer, 2009).

Figure 22.—Example of poor crossing structure fill condition.

Figure 23.—Example of poor inlet/outlet condition (blocked).

approach is [length of approach to topographic divide (miles) X road width (feet) X prism depth (inches) X 16.3] which equals cubic yards (c.y.) of sediment (fig. 24). This calculation is performed for both the right and left approach and then averaged. This metric scores 1 if the average volume is >40 c.y., scores 3 if the volume is 21 to 40 c.y., and scores 5 if volume is ≤ 20 c.y. It should be noted these criteria were derived for the Coastal Plain region of south Alabama and may need to be recalibrated for roads in other regions of the state.

Soil type (metric 8) is an estimate of soil erodibility and is quantified by determining the average weighted "K" factor of soils around the road approaches (USDA NRCS, 2015). Soil types with a K factor ≤ 0.20 score 5, 0.21 to 0.40 score 3, and K factors >0.40 score 1. The road approach slope (metric 9) is the mean slope of both road approaches. Steep slopes (>4 percent) have a greater potential for erosion and score 1, moderate slopes from 2.1 to 4.0 percent score 3, and shallow slopes ≤2.0 percent score 5. The road surface material (metric 10) is identified for each approach with roads composed of native soils receiving a score of 1, roads with all sand or clay or mixed with aggregate and native soils receiving a score of 3, and roads that were all aggregate or aggregate mixed with sand and clay or paved receiving a score of 5.

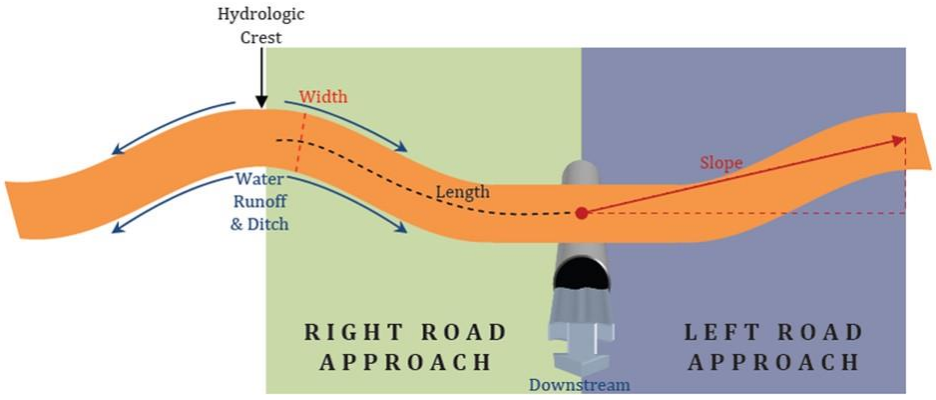


Figure 24.—Road approach dimensions (Witmer, 2009).

ROAD APPROACHES II METRICS—OUTLETS AND DITCHES

The condition of the ditches paralleling road approaches and the outlets of these ditches to the stream are important sources and conduits of sediment to streams. Each outlet (metric 11) is scored either 1 (vegetated, riprap, or synthetic cover) or 0 (bare soil, concrete, or other poor covering material). The four outlets are added together and if the total equals 4, 2, or 0, then 1 is added to the total; if the total equals 1, then 2 is added; if the total is 3, then 0 is added. This procedure results in scores of 5 (good condition), 3, or 1 (poor condition). The procedure for ditches (metric 12) is identical to that for outlets and scores in the same manner. Figures 25 and 26 compare good and poor conditions observed during a survey.

Figure 25.—Comparison of poor, fair, and good outlet conditions

Figure 26.—Comparison of a well vegetated ditch in good condition and a bare soil ditch on a steep slope in poor condition.

SURVEY RESULTS

Sedimentation risk index evaluations were conducted from October 2012 to April 2013 in the Big Canoe Creek SHU. A total of 366 stream crossing structures were evaluated, with 340 paved road crossing evaluations (93 percent) and 26 unpaved road crossings evaluations (7 percent) (fig. 27, appendix E). Considering all 366 rated evaluations, 15 sites (4.1 percent) were at high risk for sedimentation, 79 sites (21.6 percent) at moderate risk, and 272 sites (74.3 percent) at low risk (appendix E, fig. 27).

Few unpaved roads were encountered in the Big Canoe Creek watershed and only one rated high risk for sedimentation (appendix E). Unpaved roads generally present a higher risk of instream sedimentation effects compared to paved roads, but in Big Canoe Creek the unpaved roads were almost all at low risk for sedimentation. Sedimentation issues identified at high risk sites, both unpaved and paved roads, were related to the poor channel morphology (generally both upstream and downstream of the crossing), downstream channel and bank alteration/erosion due to the crossing structure, steep approaches to crossings, and poor to marginal crossing fill condition (appendix E). Crossing fill material that was not properly stabilized was a significant source of sediment at several sites.

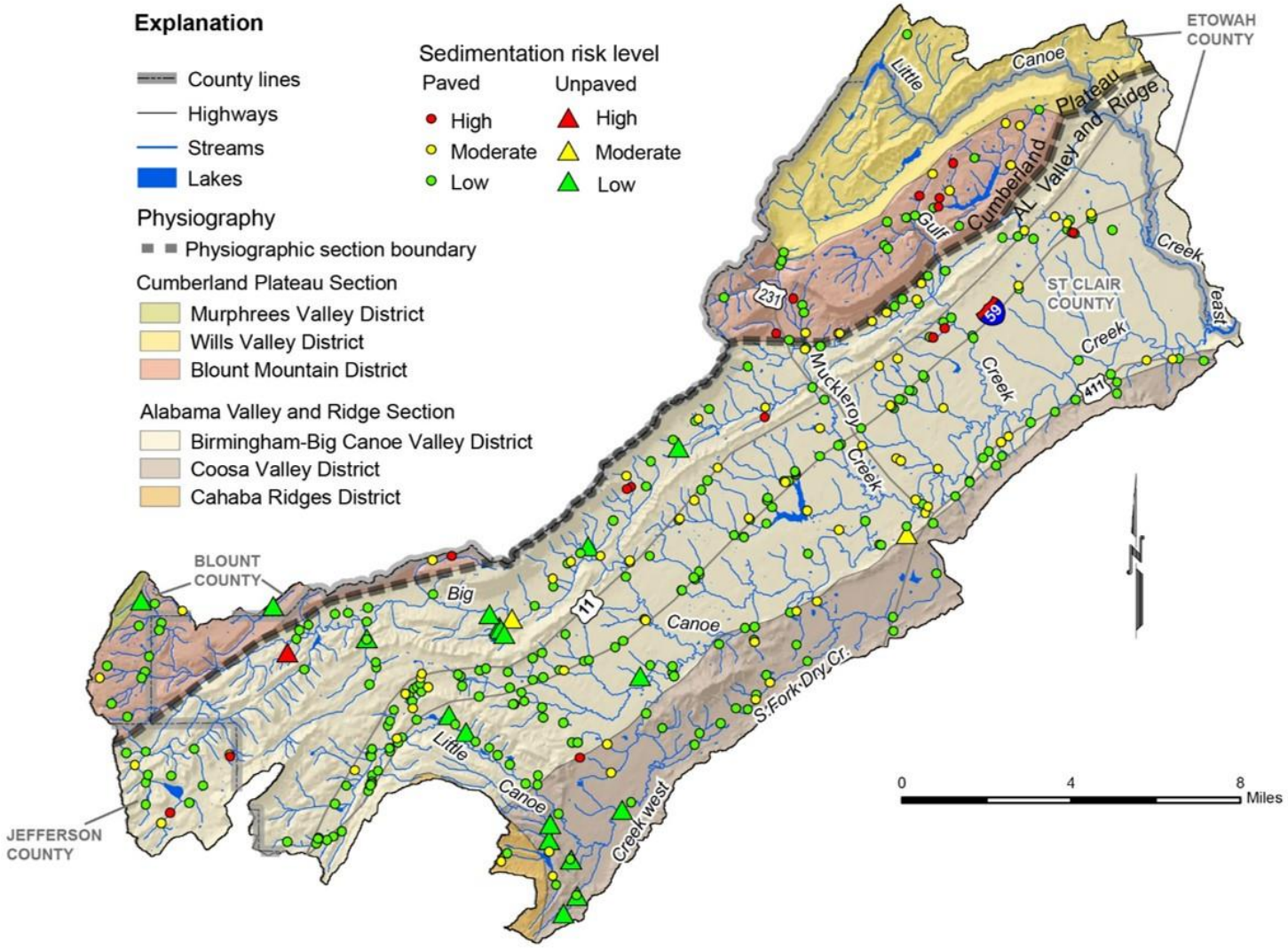


Figure 27.—Sedimentation risk level at sedimentation risk index (SRI) evaluation sites in the Big Canoe Creek watershed.

A major source of habitat impairment for aquatic fauna that was documented during the SRI surveys was lack of stream connectivity. Stream reaches become isolated by small dams and/or perched crossing structures, and these impediments restrict the movement of aquatic fauna during critical times. Connectivity of stream reaches and channels is necessary for species to access reproduction areas and allow for adequate gene flow among populations. This is often a problem for rare species because gene flow has become interrupted, ultimately leading to degraded genetic fitness and the decline of small, localized populations. Maintaining and restoring stream connectivity is an integral part of the SHU conservation mission.

Table 12 and figure 28 show twenty road-stream crossings with significant connectivity problems due to fish barriers and/or perched culverts. Perched culverts result from erosion on the downstream side of the crossing due to hydrologic changes in the stream

Table 12.—Road-stream crossings with fish barriers in the Big Canoe Creek watershed. Site numbers correspond to figure 28.

Site no.	Road Type[a]	Site name	SHU code	SRI	Risk[a]
1	P	Little Canoe Cr. at St. Clair Co. Correctional Rd.	361212131218	42	Mod
2	P	Unnamed trib. to Little Canoe Cr. at I-59 (Southbound Ln.)	361303201071	40	Mod
3	P	Unnamed trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304031087	42	Mod
4	P	Unnamed trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031002	44	Mod
5	P	Unnamed trib. to Big Canoe Cr. at Brogden Rd.	361304161574	44	Mod
6	P	Unnamed trib. to Jake Cr. at Chandler Mountain Rd.	361302061505	44	Mod
7	P	Unnamed trib. to Jake Cr. at Mount Lebanon Rd.	361302061285	40	Mod
8	P	Unnamed trib. to Jake Cr. at Mount Lebenon Rd./Bynum Rd.	361302061284	44	Mod
9	P	Unnamed trib. to Gulf Cr. Jake Cr. Rd.	361302061490	44	Mod
10	P	Unnamed trib. to Big Canoe Cr. at St Clair Co. Hwy. 31	361212111306	40	Mod
11	P	Unnamed trib. to Big Canoe Cr. on Canoe Cr. Rd.	361212111172	48	Low
12	P	Tributary to Little Canoe Cr. at Evergreen Rd.	361212131345	56	Low
13	P	Tributary to Little Canoe Cr. at I-59 North Bound Ln.	361302041391	48	Low
14	P	Tributary to Little Canoe Cr. at I-59 North Bound Ln.	361302041121	52	Low
15	U	Unnamed trib. to Big Canoe Cr. at APCO property	361303131571	50	Low
16	U	Unnamed trib. to Big Canoe Cr. at APCO property	361303131153	48	Low
17	P	Tributary to Little Canoe Cr. at Shanghi Rd.	361212121548	32	High
18	P	Unnamed trib. to Jake Cr. at Hartline Rd.	361302061079	32	High
19	P	Unnamed trib. to Gulf Cr. at St. Clair Co. Hwy. 42	361302061049	34	High
20	P	Unnamed trib. to Big Canoe Cr. at Crawford's Cove Rd.	361212111355	36	High

[a]Abbreviations: P-paved, U-unpaved, Mod-Moderate

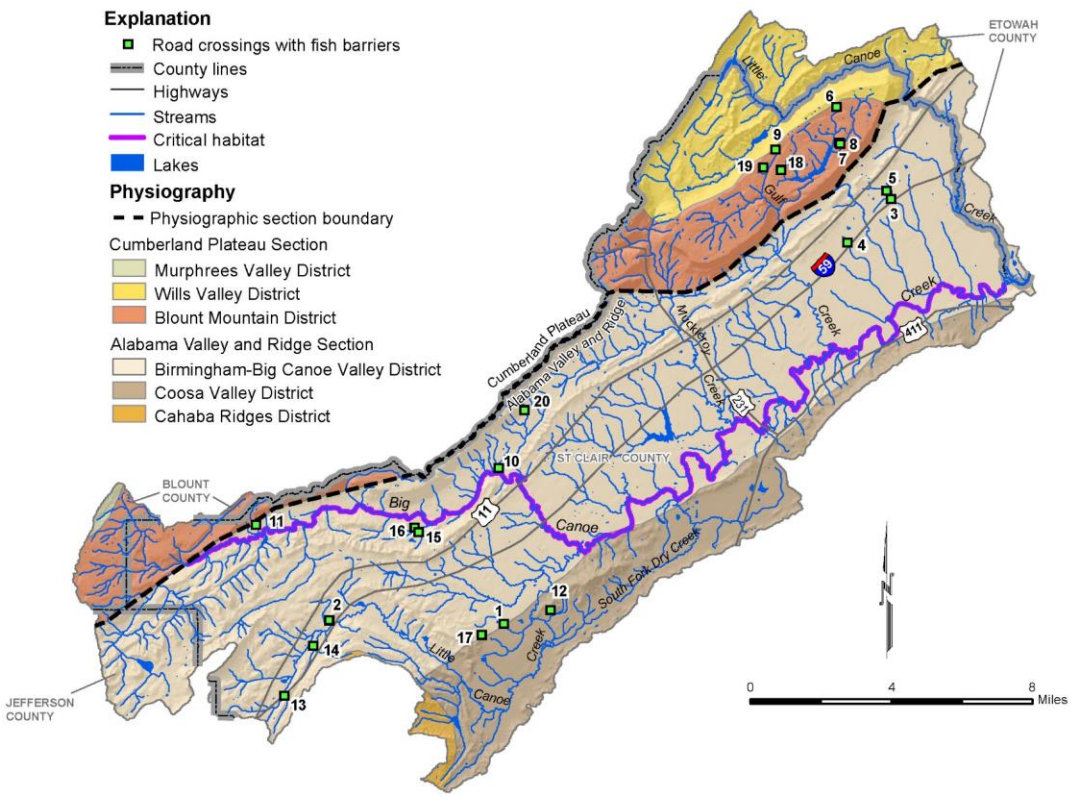


Figure 28.—Sites with fish barriers in the Big Canoe Creek watershed.

precipitated by the crossing structure. The fish barriers and/or perched culverts identified in the SRI survey should be a restoration priority in the Little Canoe Creek (west) system, because the rare Trispot Darter occurs throughout the watershed. The habitat specificity of this species makes perched culverts a real threat that restricts access to critical breeding habitat.

RECOMMENDATIONS

Managing water quality and aquatic habitat in a watershed to improve fish and wildlife conditions and maintain water quality standards is a complex undertaking because of the mix of private land ownership, wide array of state and federal environmental regulations and authorities, limited funding opportunities, and the desire of the public to maintain positive economic activity. To date, much of the work to improve water quality, restore and recover species, and generally improve the condition of water resources has largely taken place independently within agencies with varying levels of success.

REDUCE NONPOINT SOURCE POLLUTION

One issue of particular note is the pervasive problem of how to better control and manage nonpoint source pollution (NPS). Water quality permitting through the National

Pollutant Discharge Elimination System (NPDES) administered by ADEM has been reasonably effective at managing industrial and municipal pollutants, while NPS stormwater programs and Total Maximum Daily Loads (TMDL) prescriptions are addressing the NPS problem through a combination of stormwater permitting and working through the local cooperative partnership approach (CoPA), such as the Alabama Clean Water Partnership (ACWP).

Reducing NPS pollution requires working with local landowners, communities, businesses, and industries to improve, restore, and better manage water resources. The CoPA was effectively implemented in the North River watershed (Black Warrior Clean Water Partnership, 2010) and can be used successfully in the Big Canoe Creek watershed as well.

Active implementation of the CoPA requires three things:

- Compilation and use of scientifically derived water resource and watershed data such as water-quality surveys, biological surveys, habitat surveys, land-use investigations, water-quality threat analysis and surveys, water-use compilations, and water-availability determinations.
- Development of a watershed management plan (WMP) based on credible water resource data with emphasis on using voluntary BMPs, stakeholder education and awareness, and a cooperative decision-making process to attain practical objectives.
- Creation of a local partnership for the Big Canoe Creek watershed that is representative of local landowners, local governments, and local businesses that work with appropriate state and federal agencies for support.

DEVELOP A WATERSHED MANAGEMENT PLAN

A WMP can allow a complex CoPA to proceed forward systematically by identifying watershed/water-quality issues and providing stakeholders with reasonable courses of action to protect, restore, and maintain the chemical, physical, biological, and habitat integrity of aquatic ecosystems and, in the process, restore and recover imperiled species. A WMP is expected to present practical strategies to protect, maintain, or improve surface water quality; protect drinking water sources; manage NPS runoff; benefit human health and quality of life; protect imperiled species; and enhance environmental awareness in the community.

Goals for the WMP include:

- Providing opportunities for broad-based public/private sector stakeholder input into watershed management decision-making processes.
- Promoting opportunities for many and varied entities to cooperatively improve, maintain, and protect water quality, aquatic habitat, and ecosystem health.
- Identifying environmentally protective and economically practical watershed management solutions to mitigate anthropogenic influences.

Watershed management plan implementation by ADEM and the ACWP has followed nine specific key elements:

- Identify pollutant causes and sources or groups of similar sources that will need to be controlled to achieve load reductions estimated in the watershed-based protection plan.
- Estimate pollutant load reductions expected for the management measures described.
- Describe the management methods that need to be implemented to achieve the estimated load reductions and identify the critical areas in which those measures will be needed to implement the plan.
- Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the plan.
- Implement an information/education component that will be used to enhance public understanding of the project and encourage its early and continued participation in selecting, designing, and implementing NPS management measures.
- Develop a reasonably expeditious schedule for implementing the NPS management measures identified in the plan.
- Describe interim, measurable milestones for determining whether management measures or other control actions are being implemented.
- Establish criteria that can be used to determine whether pollutant loading reductions are being achieved over time and substantial progress is being made towards attaining water-quality standards and, if not, the criteria for determining whether the watershed management plan needs to be revised.
- Execute a monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item 8.

ACTION PLAN FOR BIG CANOE CREEK

The development of a complete WMP for each SHU that addresses a comprehensive suite of water quality issues and restoration/recovery objectives is highly desirable; but, if a WMP cannot be developed for a SHU due to resource constraints, an action plan for habitat restoration and species recovery should be created. As time permits, a more robust watershed plan can be created from the action plan framework.

A SHU action plan is a simple document that outlines the following:

- water resource issues affecting imperiled species in the SHU,
- where these issues/problems are located, and
- recommendations for improving aquatic habitat, water quality, and flows.

SOURCES OF IMPAIRMENT

Data gathered from SRI and rapid habitat surveys was utilized to create a matrix of water resource impairments and sources in the Big Canoe Creek watershed by subwatershed unit (table 13, figure 29).

Table 13.—Impairment matrix of the Action Plan for the Big Canoe Creek watershed. See figure 29 subwatershed map.

Subwatershed	Impairment					Sources			
	Sedimentation	Nutrients/*E. coli*	Habitat	Biological	Agricultural runoff	Roadside erosion	Urban development	Unstable stream banks	Fish barriers
1. Lower Big Canoe Creek	X	--	X	X	X	--	--	X	X
2. Little Canoe Creek (east)	X	--	X	--	--	X	--	--	--
3. Gulf Creek	X	--	--	X	--	X	--	--	X
4. Muckleroy Creek	X	--	X	--	X	X	X	--	--
5. Middle Big Canoe Creek	X	--	X	X	X	--	--	X	--
6. Pinedale Lake	--	--	--	--	--	--	--	--	--
7. Dry Creek	--	--	--	--	--	--	--	--	--
8. Little Canoe Creek (west)	X	--	X	--	--	--	X	--	X
9. Upper Big Canoe Creek	--	--	--	--	--	X	X	--	X

ROADSIDE EROSION

Roadside erosion is a common source of stream impairment. Several sites have been identified through habitat assessments and road-stream crossing surveys to be potential sites for implementing BMPs to reduce sedimentation risk. Improved sediment fences, reshaping, contouring, and vegetating bridge and culvert fill, and improving drainage ditches and outlets would reduce the risk of sedimentation identified subwatersheds.

URBAN DEVELOPMENT

Urban development is beginning to be of concern in the Big Canoe Creek watershed. Activities in and around Ashville need properly implemented stormwater management practices. The U.S. Hwy. 231 corridor and Muckleroy Creek are also areas of concern as new commercial development is initiated. The most vulnerable area for urban development in the watershed is Springville and the Ala. Hwy. 174 corridor adjacent to upper Little Canoe Creek (west). Springville is rapidly changing from a small bedroom community to a significantly larger urban area, as the population of Jefferson County expands northeast. This expansion will put increasing water quality pressure on Little Canoe Creek as housing and commercial development in the area substantially increases the sedimentation risk. In particular, small housing developments and the conversion of small pastures and farms to housing and commercial interests along Ala. Hwy. 174 has the potential to significantly alter downstream habitat in Little Canoe Creek (west).

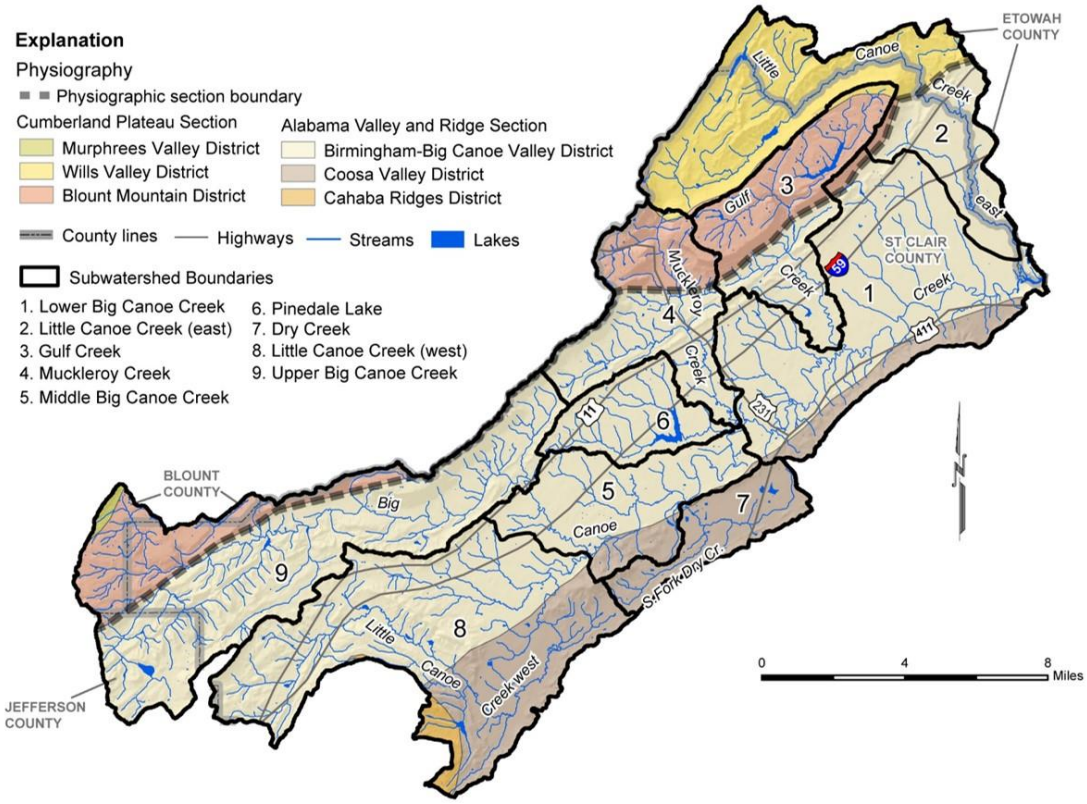


Figure 29.—Subwatersheds in the impairment matrix of the action plan for Big Canoe Creek. See table 13 for the impairment matrix.

UNSTABLE STREAM BANKS

Unstable stream banks were noted in the main channel of lower and middle Big Canoe Creek during biological assessment visits. Poor riparian buffers along the banks of stream segments supporting pastureland can promote unstable banks. Because the linear extent of this problem is not known, we recommend a continuous shoreline assessment from U.S. Hwy. 11 downstream to the H. Neely Henry impoundment. Additional biological surveys are also recommended in lower and middle Big Canoe Creek.

FISH BARRIERS

Migration passage for fishes during critical spawning periods requires unobstructed stream channels at road crossings. Surveys at road-stream crossings documented fish barrier problems at 20 sites (table 12, fig. 28). Remediating fish barriers has become a priority for the USFWS, and these crossings will be revisited and systematically evaluated and prioritized for restoration and possible removal of barriers. Some barriers are perched box culverts which will require reengineering the crossing, but others are perched metal culverts that are less expensive to repair or replace. Contact should be established with state and county road departments to begin exploring if and how these barriers can be remediated.

PRIORITY SUBWATERSHEDS

Two subwatersheds in Big Canoe Creek have been suggested as priority targets for restoration and BMP activities (table 13) in order to preserve habitat, mitigate future urban development, and remove fish barriers. These two subwatersheds are Little Canoe Creek (west) from its mouth to its headwaters and upper Big Canoe Creek from U.S. Hwy. 11 to its headwaters (fig. 29).

Little Canoe Creek (west) is home to the Trispot Darter and the Canoe Creek Clubshell, the Southern Pigtoe, the Rayed Kidneyshell, and the Finelined Pocketbook. The Trispot Darter inhabits small intermittent streams four months out of the year for breeding purposes; the remainder of the year, mid-spring through fall, is spent migrating to and from breeding areas and over-summering in deeper portions of Little Canoe Creek (west). As such, threats to the survival of the Trispot Darter may be numerous and complex, especially in areas of rapid land conversion. The Little Canoe Creek (west) watershed around Springville is a mixture of rural and urban landscapes and the many small farms and pastures are quickly being converted to neighborhoods and shopping areas as the human population expands from Jefferson County.

Urbanization results in a significant increase in impervious land areas and a parallel increase in runoff of stormwater, sediment, and pollutants. The nonbreeding habitat of the Trispot Darter could quickly degrade unless construction activities associated with rapid development are managed in a reasonable way following BMPs that will protect the main channel. This appears to be the case in Little Canoe Creek (west) between I-59 downstream to Ala. Hwy. 174. This section is rapidly developing, the stream channel has substantial bedload sediment, and stream banks have obvious signs of erosion.

Development pressure appears to be less around the identified darter breeding areas further downstream in Little Canoe Creek (west) near Ala. Hwy. 25. Migration corridors are essential, and activities that disrupt or completely sever hydrologic connectivity, such as unmanaged haul roads and blocked/perched drainage culverts, could adversely affect local darter populations by blocking migration passage. The logging operations and poorly maintained unpaved roads in these areas could potentially limit upstream movement of the Trispot Darter. However, the successful capture of breeding individuals in small seeps and channels draining both recent clear cut land and land in the early stages of regeneration, indicate that proper land management practices can help to preserve acceptable habitat conditions.

Ryon (1986) postulated that when Trispot Darter recruitment is low for a span of two to three years, a loss in local populations could follow. Another factor affecting recruitment is the effect of prolonged drought. Trispot Darters rely on seasonal wet years with sustained higher flows to recharge groundwater aquifers and maintain hydrologic quality of breeding sites during drier years. Extreme drought, or increase in the occurrence of drought, can lead to streams with extended periods of dried channels and/or low flow, ultimately affecting the ability of these fish to migrate and reproduce. When these threats become coupled, such as drought with land conversion from forested, rural areas to developed areas and/or loss of hydrologic connectivity, then the probability of negative consequences for Trispot Darter populations increases.

CONSERVATION STRATEGIES

Conservation of the Trispot Darter and Canoe Creek Clubshell will require a CoPA between willing landowners, local watershed conservation organizations, and conservation agencies. One of the most important conservation strategies is to minimize and manage stormwater runoff. Sedimentation is a problem that both the Trispot Darter and Canoe Creek Clubshell face in the main channel habitat of Little Canoe Creek (west), and in the darter's breeding habitat in small ephemeral steams. Proven ways to help control the rate of erosion include the selected harvesting of timber in wetland and riparian areas and more widespread implementation of voluntary forestry BMPs (Alabama Forestry Commission, 2007). Consistent implementation of forest management BMPs will result in a lower sediment load entering streams while maintaining the integrity of small, off channel breeding sites. Some of the small tributaries supporting Trispot Darters originate in areas that have been recently clear cut. Maintaining adequate riparian zones and establishing healthy streamside management zones around smaller intermittent tributaries will result in significant conservation opportunities for Trispot Darter populations.

The establishment of conservation easements on private land connected to significant Trispot Darter breeding sites is another viable strategy for fish habitat protection. Conservation easements can provide tax incentives to landowners who voluntarily agree to donate or sell the right to develop their land in order to protect the conservation values associated with his or her property (Nature Conservancy, 2015). Easement agreements are flexible and can be written to meet a particular landowner's needs while protecting the property's wildlife resources (USFWS, 2015). For example, an easement on property containing rare wildlife habitat might prohibit any development, while one on a farm might allow continued farming and the building of additional agricultural structures. An easement may apply to only a portion of the property and need not require public access (Land Trust Alliance, 2015). ADCNR administers the Landowner Incentive Program to provide technical assistance and funding to private landowners for the direct benefit of conserving, managing, or enhancing the habitats of high priority wildlife species. ADCNR has also partnered with NRCS to provide technical assistance to private landowners who want to create Wildlife Habitat Enhancement Units on their property (ADCNR, 2015).

A third conservation strategy is the propagation, translocation, reintroduction, and augmentation (PTRA) of imperiled mussel and/or fish species (George and others, 2009). Propagation refers to the production of individuals in a captive environment for the purpose of reintroduction. Translocation is described as the capture of individuals from the wild with the purpose of reintroducing the target species where it once previously occurred. Reintroduction is the release of the target species to their known historic range where a population no longer exists, and augmentation is when new individuals are added to a preexisting population. A plan addressing the specific biological and habitat needs and recovery goals for the Trispot Darter needs to be devised in order to implement a PTRA effort in the watershed.

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APPENDIX A

COLLECTION DATA FOR FRESHWATER MUSSEL SAMPLING SITES
IN THE BIG CANOE CREEK WATERSHED
See table 5 and figure 15 for sampling locations.

Abbreviations:

- DS—downstream
- US—upstream
- L—live
- FD—fresh dead
- WD—weathered dead
- R—relic

Data Sources (if field is blank, it is a Geological Survey of Alabama collection):

- MFM—Museum of Fluviatile Mollusks (Herb Athearn collection in North Carolina State Museum)
- NCSM—North Carolina State Museum
- AUM—Auburn University Museum
- FLMNH—Florida Museum of Natural History

	Site No.	1	2	3	3	4
	Sample Date	Historic	10/3/73	Historic	Historic	6/11/03
	Data Source	MFM		NCSM	MFM	
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	--	--	--	--
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	--	X	--	--	X
Elliptio arca	Alabama Spike	--	--	--	--	--
Elliptio arctata	Delicate Spike	--	1WD	--	--	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	3WD	X	X	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	X	--
Hamiota altilis	Finelined Pocketbook	--	2L	--	--	--
Lampsilis ornate	Southern Pocketbook	X	--	--	--	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	--	--	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	--	--	--	--
Ligumia recta	Black Sandshell	--	--	--	--	--
Medionidus acutissimus	Alabama Moccasinshell	X	--	--	--	--
Megalonaias nervosa	Washboard	--	--	--	--	--
Obliquaria reflexa	Threehorn Wartyback	--	--	--	--	--
Obovaria unicolor	Alabama Hickorynut	--	--	X	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	5FD, 2WD	--	--	--
Pleurobema decisum	Southern Clubshell	X	--	--	--	--
Pleurobema georgianum	Southern Pigtoe	--	26FD, 8WD	X	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	3WD	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	X	1WD	--	X	--
Pyganodon grandis	Giant Floater	--	--	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	--	1WD	--	--	--
Quadrula verrucosa	Pistolgrip	--	2FD, 1WD	--	--	--
Strophitus connasaugaensis	Alabama Creekmussel	--	3WD	--	X	--
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	--	--	--	--	--
Villosa lienosa	Little Spectaclecase	X	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	6WD	--	--	--
Villosa umbrans	Coosa Creekshell	--	5FD, 5WD	--	--	--
Villosa vibex	Southern Rainbow	X	--	--	--	--

	Site No.	6	8	8	8	8
	Sample Date	8/26/09	9/23/01	6/22/06	5/14/00	1/26/01
	Data Source					
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	4FD	--	3FD, 2WD	--
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	X	--	--	--	X
Elliptio arca	Alabama Spike	--	--	1FD	--	--
Elliptio arctata	Delicate Spike	--	--	--	2WD	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	--	--	--	--	--
Lampsilis ornate	Southern Pocketbook	--	--	--	--	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	--	--	--	2FD	6FD
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	4FD	--	2FD	--
Ligumia recta	Black Sandshell	--	--	--	--	--
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	--	--	--	1FD	--
Obliquaria reflexa	Threehorn Wartyback	--	--	--	--	1WD
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	--	--	--	--
Pleurobema decisum	Southern Clubshell	--	2FD, 1WD	--	2FD, 1WD	1FD
Pleurobema georgianum	Southern Pigtoe	--	--	--	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	1FD	--	2FD, 1WD	--
Pyganodon grandis	Giant Floater	--	--	--	1FD	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	--	1FD	--	4FD	10FD
Quadrula verrucosa	Pistolgrip	--	15FD	--	3FD	--
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	--
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	1R	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	--	--	--	1WD
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site No.	8	12	12	13	14
	Sample Date	9/18/99	7/30/02	9/23/01	10/14/05	5/26/04
	Data Source					
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	1FD, 1WD	2FD	2FD	--
Anodonta suborbiculata	Flat Floater	1FD	--	--	--	--
Corbicula fluminea	Asian Clam	X	X	--	--	--
Elliptio arca	Alabama Spike	--	--	--	--	--
Elliptio arctata	Delicate Spike	--	--	--	1FD	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	--	1FD, 1WD	--	1FD	1WD
Lampsilis ornate	Southern Pocketbook	--	--	2FD	1FD	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	3FD, 1WD	--	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	1WD	4FD, 1WD	1FD	1FD	1FD
Ligumia recta	Black Sandshell	--	--	--	--	1FD
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	--	1FD, 1WD	--	2FD	--
Obliquaria reflexa	Threehorn Wartyback	1FD	--	--	1FD	--
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	--	--	4WD	1WD
Pleurobema decisum	Southern Clubshell	1FD	5FD, 1WD	--	44FD, 2WD	7FD
Pleurobema georgianum	Southern Pigtoe	--	--	--	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	--	--	1WD	--
Pyganodon grandis	Giant Floater	--	--	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	1FD	--
Quadrula rumphiana	Ridged Mapleleaf	3FD, 1WD	1L, 1FD, 2WD	--	1WD	--
Quadrula verrucosa	Pistolgrip	--	7FD	5FD	5FD	1WD
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	--
Truncilla donaciformis	Fawnsfoot	--	1L	--	--	--
Utterbackia imbecillis	Paper Pondshell	1FD	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	--	--	1WD	--
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site No.	14	15	15	15	15
	Sample Date	10/1/05	9/18/99	9/9/00	8/4/01	9/22/01
	Data Source	27 transects				
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	104L	--	1L	1FD	--
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	--	--	--	--	X
Elliptio arca	Alabama Spike	--	--	--	--	--
Elliptio arctata	Delicate Spike	--	--	--	--	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	--	1WD	--	--	--
Lampsilis ornate	Southern Pocketbook	2L	1WD	--	--	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	--	--	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	1FD	3FD	--	1FD
Ligumia recta	Black Sandshell	--	--	1FD, 1WD	--	--
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	1L	--	--	--	--
Obliquaria reflexa	Threehorn Wartyback	1L	--	--	--	--
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	--	2WD	--	1L, 1FD
Pleurobema decisum	Southern Clubshell	73L	1FD, 1WD	6FD, 1 WD	1FD	1FD
Pleurobema georgianum	Southern Pigtoe	--	--	--	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	--	--	--	--
Pyganodon grandis	Giant Floater	--	--	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	15L	1WD	3FD, 3WD	--	--
Quadrula verrucosa	Pistolgrip	306L	4FD	5WD	--	1FD
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	--
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	--	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	--	--	--	--
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site. No.	15	15	18	18	18
	Sample Date	9/1/02	6/17/03	2000	2001	2002
	Data Source					
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	2FD	--	2L	1L
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	--	X	--	--	--
Elliptio arca	Alabama Spike	--	--	--	--	--
Elliptio arctata	Delicate Spike	--	1FD, 1WD	--	--	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	--	--	--	--	--
Lampsilis ornate	Southern Pocketbook	--	1WD	1L	--	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	--	1FD	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	2FD, 1WD	7L	5L	--
Ligumia recta	Black Sandshell	--	--	--	--	--
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	--	--	--	--	--
Obliquaria reflexa	Threehorn Wartyback	--	--	--	--	--
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	1WD	--	1L	1L
Pleurobema decisum	Southern Clubshell	--	4FD	6L	10L	9L
Pleurobema georgianum	Southern Pigtoe	1FD	--	1L	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	--	--	1L	--
Pyganodon grandis	Giant Floater	--	2FD	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	--	--	--	1L	--
Quadrula verrucosa	Pistolgrip	--	5FD, 1WD	37L	55L	17L
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	--
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	--	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	--	--	--	--
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site No.	20	23	23	28	31
	Sample Date	Historic	6/11/03	8/26/09	8/27/09	8/27/09
	Data Source	FLMNH				
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	--	--	--	--
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	--	X	--	X	X
Elliptio arca	Alabama Spike	--	--	--	--	--
Elliptio arctata	Delicate Spike	--	--	--	--	--
Elliptio crassidens	Elephantear	--	--	--	--	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	--	--	--	--	3R
Lampsilis ornate	Southern Pocketbook	--	--	--	--	--
Lampsilis straminea	Southern Fatmucket	--	--	--	--	--
Lampsilis teres	Yellow Sandshell	--	--	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	X	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	--	--	--	--
Ligumia recta	Black Sandshell	--	--	--	--	--
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	--	--	--	--	--
Obliquaria reflexa	Threehorn Wartyback	--	--	--	--	--
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	--	--	4L	--
Pleurobema decisum	Southern Clubshell	--	--	--	--	--
Pleurobema georgianum	Southern Pigtoe	--	--	--	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	--	1WD	1R	--
Pyganodon grandis	Giant Floater	--	--	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	--	--	--	--	--
Quadrula verrucosa	Pistolgrip	--	1WD	5L	--	--
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	1R
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	--	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	--	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	--	X	1R	--
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site No.	37	37	38	38	40
	Sample date	9/2/07	7/31/02	Historic	9/18/99	8/27/09
	Data Source			NCSM		
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	--	--	--	--	--
Anodonta suborbiculata	Flat Floater	--	--	--	--	--
Corbicula fluminea	Asian Clam	--	--	--	X	X
Elliptio arca	Alabama Spike	--	--	--	1FD, 1WD	--
Elliptio arctata	Delicate Spike	--	--	--	--	--
Elliptio crassidens	Elephantear	--	--	--	1WD	--
Epioblasma othcaloogensis	Southern Acornshell	--	--	--	--	--
Fusconaia cerina	Gulf Pigtoe	--	--	--	--	--
Hamiota altilis	Finelined Pocketbook	1FD	--	--	--	--
Lampsilis ornate	Southern Pocketbook	--	--	--	--	--
Lampsilis straminea	Southern Fatmucket	--	--	X	--	--
Lampsilis teres	Yellow Sandshell	--	--	--	--	--
Lasmigona etowaensis	Etowah Heelsplitter	--	--	--	--	--
Leptodea fragilis	Fragile Papershell	--	--	--	--	--
Ligumia recta	Black Sandshell	--	--	--	--	--
Medionidus acutissimus	Alabama Moccasinshell	--	--	--	--	--
Megalonaias nervosa	Washboard	--	--	--	--	--
Obliquaria reflexa	Threehorn Wartyback	--	--	--	--	--
Obovaria unicolor	Alabama Hickorynut	--	--	--	--	--
Pleurobema athearni	Canoe Creek Clubshell	--	--	--	2FD	--
Pleurobema decisum	Southern Clubshell	--	--	--	--	--
Pleurobema georgianum	Southern Pigtoe	1WD	--	--	--	--
Pleurobema hanleyianum	Georgia Pigtoe	--	--	--	--	--
Ptychobranchus foremanianus	Rayed Kidneyshell	--	--	--	--	--
Pyganodon grandis	Giant Floater	--	--	--	--	--
Quadrula asperata	Alabama Orb	--	--	--	--	--
Quadrula rumphiana	Ridged Mapleleaf	--	--	--	--	--
Quadrula verrucosa	Pistolgrip	--	--	--	--	--
Strophitus connasaugaensis	Alabama Creekmussel	--	--	--	--	--
Truncilla donaciformis	Fawnsfoot	--	--	--	--	--
Utterbackia imbecillis	Paper Pondshell	--	--	--	--	--
Villosa lienosa	Little Spectaclecase	--	--	--	--	--
Villosa nebulosa	Alabama Rainbow	1L, 1WD	--	--	--	--
Villosa umbrans	Coosa Creekshell	--	1L	X	--	3L
Villosa vibex	Southern Rainbow	--	--	--	--	--

	Site No.	42	L	FD	WD	R
	Sample Date	6/17/03	Total	Total	Total	Total
	Data Source					
Species Name	Common Name					
Amblema elliottii	Coosa Fiveridge	1L	108	19	3	
Anodonta suborbiculata	Flat Floater	--		1		
Corbicula fluminea	Asian Clam	--				
Elliptio arca	Alabama Spike	--		2	1	
Elliptio arctata	Delicate Spike	--		2	4	
Elliptio crassidens	Elephantear	--			1	
Epioblasma othcaloogensis	Southern Acornshell	--			3	
Fusconaia cerina	Gulf Pigtoe	--				
Hamiota altilis	Finelined Pocketbook	--	2	2	4	3
Lampsilis ornate	Southern Pocketbook	--	3	5	2	
Lampsilis straminea	Southern Fatmucket	--				
Lampsilis teres	Yellow Sandshell	--		12	1	
Lasmigona etowaensis	Etowah Heelsplitter	--				
Leptodea fragilis	Fragile Papershell	--	12	26	3	
Ligumia recta	Black Sandshell	--		2	1	
Medionidus acutissimus	Alabama Moccasinshell	--				
Megalonaias nervosa	Washboard	--	1	4	2	
Obliquaria reflexa	Threehorn Wartyback	--	1	2	1	
Obovaria unicolor	Alabama Hickorynut	--				
Pleurobema athearni	Canoe Creek Clubshell	--	7	15	3	
Pleurobema decisum	Southern Clubshell	--	98	80	7	
Pleurobema georgianum	Southern Pigtoe	--	1	27	9	
Pleurobema hanleyianum	Georgia Pigtoe	--			3	
Ptychobranchus foremanianus	Rayed Kidneyshell	--	1	3	4	1
Pyganodon grandis	Giant Floater	--		3		
Quadrula asperata	Alabama Orb	--		1		
Quadrula rumphiana	Ridged Mapleleaf	--	16	4	26	5
Quadrula verrucosa	Pistolgrip	3L	420	55	9	
Strophitus connasaugaensis	Alabama Creekmussel	--			3	1
Truncilla donaciformis	Fawnsfoot	--	1			1
Utterbackia imbecillis	Paper Pondshell	--		1		1
Villosa lienosa	Little Spectaclecase	--				
Villosa nebulosa	Alabama Rainbow	--	1		7	
Villosa umbrans	Coosa Creekshell	--	4	5	7	1
Villosa vibex	Southern Rainbow	--				

APPENDIX B

COLLECTION DATA FOR CRAYFISH SAMPLING SITES
IN THE BIG CANOE CREEK WATERSHED
See table 5 and figure 15 for sampling locations.

	Site No.	5	6	16	17	18	19
	Sample date	4/9/90	10/7/89	4/14/58	4/18/62	10/30/08	4/28/70
Species name	Common name						
Cambarus acanthura	Thornytail Crayfish	--	--	1	--	--	3
Cambarus latimanus	Variable Crayfish	--	--	14	4	--	--
Cambarus manningi	Greensaddle Crayfish	3	4	--	--	--	--
Cambarus scotti	Chattooga River Crayfish	--	--	--	2	--	12
Cambarus striatus	Ambiguous Crayfish	--	1	--	--	--	37
Orchonectes erichsonianus	Reticulate Crayfish	--	--	3	--	9	--
Procambarus clarkia	Red Swamp Crayfish	--	--	--	--	1	--
Procambarus spiculifer	White Tubercled Crayfish	--	1	--	--	--	--

	Site No.	21	22	23	24	32	34
	Sample date	10/17/09	2/11/09	10/30/08	2/11/09	6/25/09	5/1/68
Species name	Common name						
Cambarus acanthura	Thornytail Crayfish	--	--	--	--	--	1
Cambarus latimanus	Variable Crayfish	--	--	--	6	--	2
Cambarus manningi	Greensaddle Crayfish	--	--	--	--	--	--
Cambarus scotti	Chattooga River Crayfish	--	--	--	--	--	--
Cambarus striatus	Ambiguous Crayfish	4	1	--	--	1	--
Orchonectes erichsonianus	Reticulate Crayfish	--	--	7	--	--	--
Procambarus clarkia	Red Swamp Crayfish	--	--	--	--	--	--
Procambarus spiculifer	White Tubercled Crayfish	--	--	--	--	1	--

	Site No.	35	38	41	23	24	32
	Sample date	4/21/51	6/25/09	6/15/88	10/30/08	2/11/09	6/25/09
Species name	Common name						
Cambarus acanthura	Thornytail Crayfish	--	--	--	--	--	--
Cambarus latimanus	Variable Crayfish	--	--	--	--	6	--
Cambarus manningi	Greensaddle Crayfish	--	--	1	--	--	--
Cambarus scotti	Chattooga River Crayfish	--	--	--	--	--	--
Cambarus striatus	Ambiguous Crayfish	3	--	--	--	--	1
Orchonectes erichsonianus	Reticulate Crayfish	--	2	--	7	--	--
Procambarus clarkia	Red Swamp Crayfish	--	--	--	--	--	--
Procambarus spiculifer	White Tubercled Crayfish	--	--	--	--	--	1

	Site No.	34	35	38	41
	Sample date	5/1/68	4/21/51	6/25/09	6/15/88
Species name	Common name				
Cambarus acanthura	Thornytail Crayfish	1	--	--	--
Cambarus latimanus	Variable Crayfish	2	--	--	--
Cambarus manningi	Greensaddle Crayfish	--	--	--	1
Cambarus scotti	Chattooga River Crayfish	--	--	--	--
Cambarus striatus	Ambiguous Crayfish	--	3	--	--
Orchonectes erichsonianus	Reticulate Crayfish	--	--	2	--
Procambarus clarkia	Red Swamp Crayfish	--	--	--	--
Procambarus spiculifer	White Tubercled Crayfish	--	--	--	--

APPENDIX C

COLLECTION DATA FOR FISH IBI SAMPLING SITES
IN THE BIG CANOE CREEK WATERSHED
See table 5 and figure 15 for sampling locations.

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	2	4	4	4	7	10
	GSA No.	1248	2753	2075	1231	1236	1249
Family	Sample date	06/14/12	09/29/04	06/25/09	06/13/12	06/13/12	06/20/12
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	--	--	--	--	--	--
Lepisosteus osseus,	Longnose Gar	--	--	--	--	--	--
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	--	--	--
Dorosoma petenense	Threadfin Shad	--	--	--	--	--	--
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	12	49	13	26	42	15
Carassius auritus	Goldfish	--	--	--	--	--	--
Cyprinella callistia	Alabama Shiner	--	5	--	2	--	1
Cyprinella trichroistia	Tricolor Shiner	59	79	60	76	106	--
Cyprinella venusta	Blacktail Shiner	7	1	--	2	--	20
Lythrurus bellus	Pretty Shiner	--	--	--	--	--	--
Lythrurus lirus	Mountain Shiner	--	--	--	--	--	--
Notropis chrosomus	Rainbow Shiner	--	--	--	--	--	--
Notropis stilbius	Silverstripe Shiner	1	--	--	--	--	13
Notropis xaenocephalus	Coosa Shiner	8	28	80	14	42	--
Phenacobius catostomus	Riffle Minnow	5	5	1	--	--	--
Pimephales notatus	Bluntnose Minnow	--	--	--	--	--	--
Pimephales promelas	Fathead Minnow	--	--	--	--	--	--
Pimephales vigilax	Bullhead Minnow	--	--	--	--	--	5
Semotilus atromaculatus	Creek Chub	--	--	1	1	--	--
Catostomidae – suckers							
Hypentelium etowanum	Alabama Hog Sucker	13	19	13	12	21	7
Minytrema melanops	Spotted Sucker	--	1	--	--	--	--
Moxostoma duquesnei	Black Redhorse	--	--	--	--	--	--
Moxostoma erythrurum	Golden Redhorse	--	--	1	--	--	--
Moxostoma poecilurum	Blacktail Redhorse	--	--	--	--	--	1
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	--	--	--	--
Ameiurus natalis	Yellow Bullhead	--	--	--	--	--	--
Ictalurus punctatus	Channel Catfish	--	--	--	--	--	--
Noturus leptacanthus	Speckled Madtom	2	--	1	--	--	--
Pylodictis olivaris	Flathead Catfish	--	--	--	--	--	--

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	2	4	4	4	7	10
	GSA No.	1248	2753	2075	1231	1236	1249
Family	Sample date	06/14/12	09/29/04	06/25/09	06/13/12	06/13/12	06/20/12
Species name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	6	2	--	--	--	4
Fundulus stellifer	Southern Studfish	--	--	--	--	--	--
Poeciliidae –livebearers							
Gambusia affinis	Western Mosquitofish	--	--	1	--	--	9
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	23	34	39	32	52	3
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	--	--	1	2	--	--
Lepomis auritus	Redbreast Sunfish	7	15	25	8	--	12
Lepomis cyanellus	Green Sunfish	7	4	4	1	7	3
Lepomis gulosus	Warmouth	1	--	1	--	--	--
Lepomis macrochirus	Bluegill	14	13	20	7	13	7
Lepomis megalotis	Longear Sunfish	15	23	23	14	3	7
Lepomis microlophus	Redear Sunfish	1	2	2	2	--	2
Lepomis miniatus	Redspotted Sunfish	--	4	1	9	--	2
Micropterus coosae	Redeye Bass	3	6	4	8	7	--
Micropterus henshalli	Alabama Bass	--	--	--	--	--	3
Micropterus salmoides	Largemouth Bass	--	--	--	--	--	--
Pomoxis annularis	White Crappie	--	--	--	--	--	1
Pomoxis nigromaculatus	Black Crappie	1	--	--	--	--	--
hybrid centrarchid		--	--	1	2	--	--
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	--	3	4	3	15	--
Etheostoma ditrema	Coldwater Darter	--	--	1	--	--	--
Etheostoma jordani	Greenbreast Darter	16	11	14	27	29	5
Etheostoma stigmaeum	Speckled Darter	3	2	2	4	1	2
Etheostoma trisella	Trispot Darter	--	--	--	--	--	--
Percina kathae	Mobile Logperch	--	4	3	1	--	--
Percina nigrofasciata	Blackbanded Darter	3	11	2	23	--	10
Percina shumardi	River Darter	--	--	--	--	--	1
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	--	--	--	--	--	--
Catch		207	321	318	276	338	133
Total number of species		21	22	25	21	12	22

	Site No.	11	17	18	18	18	23
	GSA No.	1250	1240	2195	2074	1239	2194
Family	Sample date	06/20/12	06/22/12	10/30/08	06/26/09	06/13/12	10/30/08
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	--	--	--	--	--	--
Lepisosteus osseus,	Longnose Gar	--	--	--	--	--	--
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	--	3	--
Dorosoma petenense	Threadfin Shad	--	--	--	--	--	--
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	21	7	45	16	56	38
Carassius auritus	Goldfish	--	--	--	2	--	--
Cyprinella callistia	Alabama Shiner	--	5	21	16	11	31
Cyprinella trichroistia	Tricolor Shiner	--	--	--	1	--	49
Cyprinella venusta	Blacktail Shiner	4	--	25	17	11	20
Lythrurus bellus	Pretty Shiner	--	--	--	--	--	--
Lythrurus lirus	Mountain Shiner	--	15	--	--	--	--
Notropis chrosomus	Rainbow Shiner	--	--	--	--	--	--
Notropis stilbius	Silverstripe Shiner	1	--	6	12	4	21
Notropis xaenocephalus	Coosa Shiner	--	13	--	9	--	--
Phenacobius catostomus	Riffle Minnow	--	--	4	6	3	2
Pimephales notatus	Bluntnose Minnow	--	--	--	--	1	--
Pimephales promelas	Fathead Minnow	--	--	--	--	--	--
Pimephales vigilax	Bullhead Minnow	--	--	3	2	--	--
Semotilus atromaculatus	Creek Chub	--	--	--	--	--	--
Catostomidae –suckers							
Hypentelium etowanum	Alabama Hog Sucker	14	6	13	12	9	9
Minytrema melanops	Spotted Sucker	--	--	--	--	--	--
Moxostoma duquesnei	Black Redhorse	--	1	--	--	--	--
Moxostoma erythrurum	Golden Redhorse	--	--	--	--	4	--
Moxostoma poecilurum	Blacktail Redhorse	--	--	--	1	--	--
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	--	--	--	--
Ameiurus natalis	Yellow Bullhead	--	--	--	1	--	--
Ictalurus punctatus	Channel Catfish	--	--	1	1	--	--
Noturus leptacanthus	Speckled Madtom	1	--	2	4	8	2
Pylodictis olivaris	Flathead Catfish	--	--	--	1	--	--

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	11	17	18	18	18	23
	GSA No.	1250	1240	2195	2074	1239	2194
Family	Sample date	06/20/12	06/22/12	10/30/08	06/26/09	06/13/12	10/30/08
Species name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	8	2	1	5	2	1
Fundulus stellifer	Southern Studfish	--	--	--	--	--	--
Poeciliidae—livebearers							
Gambusia affinis	Western Mosquitofish	--	4	9	5	7	3
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	12	24	29	52	99	10
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	--	--	1	1	--	--
Lepomis auritus	Redbreast Sunfish	18	1	11	18	5	2
Lepomis cyanellus	Green Sunfish	10	17	--	1	3	--
Lepomis gulosus	Warmouth	1	2	--	3	--	1
Lepomis macrochirus	Bluegill	8	35	18	21	3	5
Lepomis megalotis	Longear Sunfish	16	32	11	43	9	2
Lepomis microlophus	Redear Sunfish	--	--	--	--	--	1
Lepomis miniatus	Redspotted Sunfish	7	--	--	--	1	1
Micropterus coosae	Redeye Bass	--	6	--	2	1	1
Micropterus henshalli	Alabama Bass	2	2	2	6	1	3
Micropterus salmoides	Largemouth Bass	1	--	--	--	--	--
Pomoxis annularis	White Crappie	--	--	--	--	--	--
Pomoxis nigromaculatus	Black Crappie	--	--	--	1	--	--
hybrid centrarchid		1	--	--	--	3	--
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	2	9	1	--	--	3
Etheostoma ditrema	Coldwater Darter	--	--	--	--	--	--
Etheostoma jordani	Greenbreast Darter	--	--	25	26	85	40
Etheostoma stigmaeum	Speckled Darter	--	12	13	1	5	14
Etheostoma trisella	Trispot Darter	--	--	--	--	--	3
Percina kathae	Mobile Logperch	--	--	--	--	1	--
Percina nigrofasciata	Blackbanded Darter	12	10	11	7	8	1
Percina shumardi	River Darter	--	--	--	--	--	--
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	--	--	--	--	--	1
Catch		139	203	252	293	343	264
Total number of species		17	19	21	30	24	25

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	23	23	25	26	27	28
	GSA No.	2078	1230	1254	1235	1229	2073
Family	Sample date	06/25/09	06/13/12	06/20/12	06/11/12	06/11/12	06/26/09
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	--	--	--	--	--	--
Lepisosteus osseus	Longnose Gar	--	--	--	--	--	--
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	6	4	--
Dorosoma petenense	Threadfin Shad	--	--	--	2	--	--
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	59	36	36	46	22	11
Carassius auritus	Goldfish	--	--	--	--	--	--
Cyprinella callistia	Alabama Shiner	1	12	--	13	7	10
Cyprinella trichroistia	Tricolor Shiner	11	24	227	15	27	5
Cyprinella venusta	Blacktail Shiner	--	2	--	9	29	15
Lythrurus bellus	Pretty Shiner	--	--	--	--	--	1
Lythrurus lirus	Mountain Shiner	--	--	65	--	1	3
Notropis chrosomus	Rainbow Shiner	1	--	53	--	--	--
Notropis stilbius	Silverstripe Shiner	12	2	--	24	9	--
Notropis xaenocephalus	Coosa Shiner	2	--	29	--	--	--
Phenacobius catostomus	Riffle Minnow	8	2	--	4	3	5
Pimephales notatus	Bluntnose Minnow	--	--	--	--	--	--
Pimephales promelas	Fathead Minnow	--	--	--	--	--	--
Pimephales vigilax	Bullhead Minnow	--	--	--	--	--	--
Semotilus atromaculatus	Creek Chub	1	--	3	--	--	7
Catostomidae—suckers							
Hypentelium etowanum	Alabama Hog Sucker	8	8	19	11	14	22
Minytrema melanops	Spotted Sucker	--	--	--	--	--	2
Moxostoma duquesnei	Black Redhorse	--	--	--	--	2	1
Moxostoma erythrurum	Golden Redhorse	1	--	--	5	5	--
Moxostoma poecilurum	Blacktail Redhorse	--	--	--	1	3	--
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	2	--	--	--
Ameiurus natalis	Yellow Bullhead	--	--	1	--	--	1
Ictalurus punctatus	Channel Catfish	1	--	--	--	--	3
Noturus leptacanthus	Speckled Madtom	2	1	--	--	1	--
Pylodictis olivaris	Flathead Catfish	--	--	--	--	--	--

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	23	23	25	26	27	28
	GSA No.	2078	1230	1254	1235	1229	2073
Family	Sample date	06/25/09	06/13/12	06/20/12	06/11/12	06/11/12	06/26/09
Species Name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	4	1	11	4	2	--
Fundulus stellifer	Southern Studfish	--	--	--	--	--	--
Poeciliidae—livebearers							
Gambusia affinis	Western Mosquitofish	4	--	2	--	--	--
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	5	46	17	17	41	8
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	--	--	--	--	1	--
Lepomis auritus	Redbreast Sunfish	29	6	6	21	21	13
Lepomis cyanellus	Green Sunfish	2	2	14	4	20	13
Lepomis gulosus	Warmouth	2	--	--	--	1	--
Lepomis macrochirus	Bluegill	10	6	2	6	7	23
Lepomis megalotis	Longear Sunfish	9	10	21	23	12	16
Lepomis microlophus	Redear Sunfish	--	--	--	--	2	--
Lepomis miniatus	Redspotted Sunfish	--	4	--	1	--	--
Micropterus coosae	Redeye Bass	2	--	2	1	--	--
Micropterus henshalli	Alabama Bass	--	--	--	2	--	--
Micropterus salmoides	Largemouth Bass	--	--	--	--	--	--
Pomoxis annularis	White Crappie	--	--	--	--	--	--
Pomoxis nigromaculatus	Black Crappie	--	--	--	1	1	--
hybrid centrarchid		--	--	--	1	--	--
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	--	2	10	--	2	2
Etheostoma ditrema	Coldwater Darter	15	--	--	--	--	--
Etheostoma jordani	Greenbreast Darter	44	81	13	24	9	4
Etheostoma stigmaeum	Speckled Darter	1	2	14	5	13	14
Etheostoma trisella	Trispot Darter	1	--	--	--	1	1
Percina kathae	Mobile Logperch	1	1	--	1	1	--
Percina nigrofasciata	Blackbanded Darter	5	7	9	10	11	16
Percina shumardi	River Darter	--	--	--	--	--	--
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	1	--	--	2	--	2
Catch		242	255	556	259	272	198
Total number of species		28	20	21	26	29	24

	Site No.	29	29	30	31	33	36
	GSA No.	2081	1232	1975	1233	1228	1803
Family	Sample date	06/30/09	06/12/12	05/06/10	06/12/12	06/12/12	05/27/10
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	--	--	--	--	--	--
Lepisosteus osseus	Longnose Gar	--	--	--	--	--	--
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	--	--	--
Dorosoma petenense	Threadfin Shad	--	--	--	--	--	--
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	18	39	12	9	99	36
Carassius auritus	Goldfish	--	--	--	--	--	--
Cyprinella callistia	Alabama Shiner	4	4	--	--	--	9
Cyprinella trichroistia	Tricolor Shiner	9	12	4	8	7	8
Cyprinella venusta	Blacktail Shiner	16	12	5	2	2	8
Lythrurus bellus	Pretty Shiner	--	--	--	--	--	--
Lythrurus lirus	Mountain Shiner	5	--	--	1	5	--
Notropis chrosomus	Rainbow Shiner	--	--	--	--	2	--
Notropis stilbius	Silverstripe Shiner	11	7	4	--	2	--
Notropis xaenocephalus	Coosa Shiner	--	1	--	1	134	--
Phenacobius catostomus	Riffle Minnow	--	3	1	2	3	1
Pimephales notatus	Bluntnose Minnow	--	--	--	--	--	--
Pimephales promelas	Fathead Minnow	--	--	2	--	--	--
Pimephales vigilax	Bullhead Minnow	--	--	--	--	--	--
Semotilus atromaculatus	Creek Chub	--	--	1	--	1	--
Catostomidae—suckers							
Hypentelium etowanum	Alabama Hog Sucker	11	7	15	12	13	37
Minytrema melanops	Spotted Sucker	--	--	1	2	--	--
Moxostoma duquesnei	Black Redhorse	--	--	--	6	1	--
Moxostoma erythrurum	Golden Redhorse	1	1	5	2	7	3
Moxostoma poecilurum	Blacktail Redhorse	--	1	2	--	--	1
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	--	--	--	--
Ameiurus natalis	Yellow Bullhead	1	--	1	--	--	--
Ictalurus punctatus	Channel Catfish	--	--	--	--	--	--
Noturus leptacanthus	Speckled Madtom	2	4	--	--	--	4
Pylodictis olivaris	Flathead Catfish	--	--	--	--	--	--

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	29	29	30	31	33	36
	GSA No.	2081	1232	1975	1233	1228	1803
Family	Sample date	06/30/09	06/12/12	05/06/10	06/12/12	06/12/12	05/27/10
Species Name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	4	4	14	1	--	8
Fundulus stellifer	Southern Studfish	--	--	--	--	8	16
Poeciliidae –livebearers							
Gambusia affinis	Western Mosquitofish	1	--	1	--	--	14
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	3	5	2	12	15	95
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	--	--	--	--	--	3
Lepomis auritus	Redbreast Sunfish	8	15	20	4	7	23
Lepomis cyanellus	Green Sunfish	1	16	7	6	132	12
Lepomis gulosus	Warmouth	--	1	--	1	2	--
Lepomis macrochirus	Bluegill	10	20	28	18	43	37
Lepomis megalotis	Longear Sunfish	12	10	26	2	6	60
Lepomis microlophus	Redear Sunfish	1	--	2	1	5	2
Lepomis miniatus	Redspotted Sunfish	--	--	--	--	--	--
Micropterus coosae	Redeye Bass	1	3	2	1	2	4
Micropterus henshalli	Alabama Bass	--	2	--	--	--	--
Micropterus salmoides	Largemouth Bass	2	1	2	3	3	9
Pomoxis annularis	White Crappie	--	--	1	--	--	--
Pomoxis nigromaculatus	Black Crappie	--	2	--	2	--	--
hybrid centrarchid		--	--	1	--	--	--
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	4	2	5	1	28	3
Etheostoma ditrema	Coldwater Darter	--	--	--	--	--	--
Etheostoma jordani	Greenbreast Darter	7	37	3	14	6	74
Etheostoma stigmaeum	Speckled Darter	12	17	2	3	29	8
Etheostoma trisella	Trispot Darter	--	--	--	--	--	--
Percina kathae	Mobile Logperch	--	--	--	--	--	4
Percina nigrofasciata	Blackbanded Darter	13	11	5	14	15	10
Percina shumardi	River Darter	--	--	--	--	--	--
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	--	--	1	--	--	--
Catch		157	237	175	128	577	489
Total number of species		24	26	28	25	26	26

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	36	37	37	38	38	39
	GSA No.	1234	1185	1184	2079	1238	1237
Family	Sample date	06/13/12	05/15/13	05/15/13	06/30/09	06/11/12	06/14/12
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	1	--	--	--	--	--
Lepisosteus osseus	Longnose Gar	--	--	1	--	--	--
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	--	--	--
Dorosoma petenense	Threadfin Shad	--	--	--	--	--	--
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	417	--	59	48	73	34
Carassius auritus	Goldfish	--	--	--	--	--	--
Cyprinella callistia	Alabama Shiner	15	--	10	139	59	36
Cyprinella trichroistia	Tricolor Shiner	16	128	100	373	209	255
Cyprinella venusta	Blacktail Shiner	6	3	3	9	13	2
Lythrurus bellus	Pretty Shiner	--	--	--	--	--	--
Lythrurus lirus	Mountain Shiner	--	142	2	21	3	11
Notropis chrosomus	Rainbow Shiner	--	--	4	--	1	1
Notropis stilbius	Silverstripe Shiner	25	7	17	1	3	20
Notropis xaenocephalus	Coosa Shiner	--	--	2	13	12	65
Phenacobius catostomus	Riffle Minnow	5	--	5	--	1	7
Pimephales notatus	Bluntnose Minnow	--	--	--	--	--	--
Pimephales promelas	Fathead Minnow	--	--	1	--	--	--
Pimephales vigilax	Bullhead Minnow	--	--	--	--	--	--
Semotilus atromaculatus	Creek Chub	2	--	--	--	--	--
Catostomidae—suckers							
Hypentelium etowanum	Alabama Hog Sucker	29	4	6	20	5	24
Minytrema melanops	Spotted Sucker	1	--	--	--	--	--
Moxostoma duquesnei	Black Redhorse	--	--	--	3	--	--
Moxostoma erythrurum	Golden Redhorse	2	--	--	2	--	1
Moxostoma poecilurum	Blacktail Redhorse	--	--	--	--	--	--
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	--	--	--	--
Ameiurus natalis	Yellow Bullhead	--	--	2	1	--	--
Ictalurus punctatus	Channel Catfish	--	--	--	--	--	--
Noturus leptacanthus	Speckled Madtom	--	1	2	--	4	--
Pylodictis olivaris	Flathead Catfish	--	--	--	--	--	--

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	29	29	30	31	33	36
	GSA No.	2081	1232	1975	1233	1228	1803
Family	Sample date	06/30/09	06/12/12	05/06/10	06/12/12	06/12/12	05/27/10
Species Name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	6	7	8	--	1	--
Fundulus stellifer	Southern Studfish	9	--	--	--	--	8
Poeciliidae—livebearers							
Gambusia affinis	Western Mosquitofish	33	--	1	--	2	--
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	76	2	78	52	29	45
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	1	--	2	--	--	3
Lepomis auritus	Redbreast Sunfish	15	18	23	18	2	3
Lepomis cyanellus	Green Sunfish	2	9	5	3	2	2
Lepomis gulosus	Warmouth	--	--	--	1	2	--
Lepomis macrochirus	Bluegill	8	1	13	10	5	2
Lepomis megalotis	Longear Sunfish	60	24	27	20	4	33
Lepomis microlophus	Redear Sunfish	1	--	--	3	--	--
Lepomis miniatus	Redspotted Sunfish	2	--	1	--	--	--
Micropterus coosae	Redeye Bass	1	3	4	9	10	8
Micropterus henshalli	Alabama Bass	3	--	1	1	--	2
Micropterus salmoides	Largemouth Bass	2	--	--	2	--	--
Pomoxis annularis	White Crappie	--	--	--	--	--	--
Pomoxis nigromaculatus	Black Crappie	--	--	1	--	--	--
hybrid centrarchid		--	--	1	--	--	1
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	5	--	13	4	11	10
Etheostoma ditrema	Coldwater Darter	--	--	--	--	--	--
Etheostoma jordani	Greenbreast Darter	84	--	71	47	53	77
Etheostoma stigmaeum	Speckled Darter	4	2	21	4	1	4
Etheostoma trisella	Trispot Darter	--	--	--	--	--	--
Percina kathae	Mobile Logperch	3	1	--	--	--	1
Percina nigrofasciata	Blackbanded Darter	4	3	12	19	14	7
Percina shumardi	River Darter	--	--	--	--	--	--
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	--	--	--	--	--	--
Catch		838	355	496	823	519	662
Total number of species		30	16	30	25	24	25

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	40	42	42	43	Total	Percent
	GSA No.	1244	2080	1242	1243	collected	of total
Family	Sample date	06/12/12	06/30/09	06/12/12	06/12/12		
Species name	Common name						
Lepisosteidae—gars							
Lepisosteus oculatus	Spotted Gar	--	--	--	--	1	0.01
Lepisosteus osseus	Longnose Gar	--	--	--	--	1	0.01
Clupeidae—shads							
Dorosoma cepedianum	Gizzard Shad	--	--	--	--	13	0.1
Dorosoma petenense	Threadfin Shad	--	--	--	--	2	0.02
Cyprinidae—carps and minnows							
Campostoma oligolepis	Largescale Stoneroller	64	35	68	116	1,677	12.76
Carassius auritus	Goldfish	--	--	--	--	2	0.02
Cyprinella callistia	Alabama Shiner	42	16	29	16	514	3.91
Cyprinella trichroistia	Tricolor Shiner	163	120	192	45	2,388	18.17
Cyprinella venusta	Blacktail Shiner	2	1	--	--	246	1.87
Lythrurus bellus	Pretty Shiner	--	--	--	--	1	0.01
Lythrurus lirus	Mountain Shiner	194	7	30	36	541	4.12
Notropis chrosomus	Rainbow Shiner	51	39	40	42	234	1.78
Notropis stilbius	Silverstripe Shiner	52	34	43	7	338	2.57
Notropis xaenocephalus	Coosa Shiner	56	24	102	110	745	5.67
Phenacobius catostomus	Riffle Minnow	7	4	13	1	101	0.77
Pimephales notatus	Bluntnose Minnow	--	--	--	--	1	0.01
Pimephales promelas	Fathead Minnow	--	--	--	--	3	0.02
Pimephales vigilax	Bullhead Minnow	--	--	--	--	10	0.08
Semotilus atromaculatus	Creek Chub	--	1	--	--	18	0.14
Catostomidae—suckers							
Hypentelium etowanum	Alabama Hog Sucker	4	15	12	4	448	3.41
Minytrema melanops	Spotted Sucker	--	--	--	--	7	0.05
Moxostoma duquesnei	Black Redhorse	1	--	2	--	17	0.13
Moxostoma erythrurum	Golden Redhorse	--	--	--	--	40	0.3
Moxostoma poecilurum	Blacktail Redhorse	--	--	--	--	10	0.08
Ictaluridae—North American catfishes							
Ameiurus melas	Black Bullhead	--	--	--	--	2	0.02
Ameiurus natalis	Yellow Bullhead	--	--	1	--	9	0.07
Ictalurus punctatus	Channel Catfish	--	--	--	--	6	0.05
Noturus leptacanthus	Speckled Madtom	--	--	1	1	43	0.33
Pylodictis olivaris	Flathead Catfish	--	--	--	--	1	0.01

Appendix C—Collection Data for Fish IBI Sampling Sites,
Big Canoe Creek Watershed

	Site No.	29	29	30	31	33	36
	GSA No.	2081	1232	1975	1233	1228	1803
Family	Sample date	06/30/09	06/12/12	05/06/10	06/12/12	06/12/12	05/27/10
Species Name	Common name						
Fundulidae—topminnows							
Fundulus olivaceus	Blackspotted Topminnow	2	4	--	5	117	0.89
Fundulus stellifer	Southern Studfish	19	3	1	1	65	0.49
Poeciliidae—livebearers							
Gambusia affinis	Western Mosquitofish	--	--	--	--	96	0.73
Cottidae—sculpins							
Cottus carolinae	Banded Sculpin	128	88	57	113	1,343	10.22
Centrarchidae—sunfishes							
Ambloplites ariommus	Shadow Bass	7	3	3	1	29	0.22
Lepomis auritus	Redbreast Sunfish	4	10	2	2	392	2.98
Lepomis cyanellus	Green Sunfish	1	9	6	--	325	2.47
Lepomis gulosus	Warmouth	--	2	--	--	21	0.16
Lepomis macrochirus	Bluegill	--	7	9	7	436	3.32
Lepomis megalotis	Longear Sunfish	6	37	21	46	683	5.20
Lepomis microlophus	Redear Sunfish	--	--	--	--	27	0.21
Lepomis miniatus	Redspotted Sunfish	--	--	--	--	33	0.25
Micropterus coosae	Redeye Bass	4	1	6	7	109	0.83
Micropterus henshalli	Alabama Bass	--	--	--	--	30	0.23
Micropterus salmoides	Largemouth Bass	--	--	--	--	25	0.19
Pomoxis annularis	White Crappie	--	--	--	--	2	0.02
Pomoxis nigromaculatus	Black Crappie	--	--	--	--	9	0.07
hybrid centrarchid		--	1	--	--	12	0.09
Percidae—darters and perches							
Etheostoma coosae	Coosa Darter	42	13	7	16	220	1.67
Etheostoma ditrema	Coldwater Darter	--	--	--	--	16	0.12
Etheostoma jordani	Greenbreast Darter	91	48	68	18	1,151	8.76
Etheostoma stigmaeum	Speckled Darter	3	8	1	11	238	1.81
Etheostoma trisella	Trispot Darter	--	--	--	--	6	0.05
Percina kathae	Mobile Logperch	--	1	--	--	23	0.17
Percina nigrofasciata	Blackbanded Darter	5	5	3	13	309	2.35
Percina shumardi	River Darter	--	--	--	--	1	0.01
Sciaenidae—drums							
Aplodinotus grunniens	Freshwater Drum	--	--	--	--	7	0.05
Catch		948	536	717	618	13,144	100
Total number of species		23	26	24	22	55	

APPENDIX D

RAPID HABITAT ASSESSMENT AND SEDIMENTATION RISK INDEX (SRI)
FIELD DATA SHEETS

- Riffle/Run Habitat Assessment field data sheet
- Glide/Pool Habitat Assessment field data sheet
- Sedimentation Risk Index field data sheet (2 pages)

ADEM-FIELD OPERATIONS-MONTGOMERY BRANCH
RIFFLE/RUN HABITAT ASSESSMENT FIELD DATA SHEET

Name of Waterbody _____ Date: _____
Station Number _____ Investigators _____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1 **Instream Cover**	>50% mix of boulder, cobble, submerged logs, undercut banks, or other stable habitat.	50-30% mix of boulder, cobble, or other stable habitat; adequate habitat.	30-10% mix of boulder, cobble, or other stable habitat; habitat availability less than desirable.	<10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2 **Epifaunal surface**	Well-developed riffle and run; riffles as wide as stream and length is 2x the width of stream; abundance of cobble.	Riffle is as wide as stream, but length is <2 times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is <2 times the stream width; gravel or large boulders and bedrock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3 **Embeddedness**	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble and boulder particles are >75% surrounded by fine sediment.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4 **Velocity/Depth Regimes**	All 4 velocity/depth regimes present (slow-deep, slow-shallow, fast-shallow, fast-deep).	Only 3 of 4 regimes present. (if fast-shallow is missing, score lower.)	Only 2 of 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5 **Man-made Channel Alteration**	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent.	New embankments present on both banks; and 40 - 80% of stream reach is channelized and disrupted.	Banks shored with gabion or cement; >80% of the stream reach channelized and disrupted.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6 **Sediment Deposition**	Little or no enlargement of islands or point bars and less than 5 % of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel or coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; > 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7 **Frequency of Riffles** (Distance between riffles/ stream width)	<5 5 6 7	8 9 11 13 15	16 18 21 23 25	26 28 30 32 34 ≥ 35
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8 **Channel flow Status**	Water reaches base of both lower banks.	Water fills >75% of the available channel.	Water fills 75 - 25% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
9 **Condition of Banks**	Banks stable; no evidence (<5%) of erosion or bank failure.	Moderately stable; infrequent, small areas (5-30%) of erosion mostly healed over.	Moderately unstable; 30-60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent Along straight section and bends; on side slopes, 60-100% of bank has erosional scars.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
10 **Bank Vegetative Protection**	>90% of the streambank surfaces covered by vegetation.	90-70% of the streambank surfaces covered by vegetation.	70-50% of the streambank surfaces covered by vegetation.	<50% of the streambank surfaces covered by vegetation.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
11 **Grazing or other disruptive pressure**	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; >1/2 of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; < 1/2 of the potential plant stubble height remaining.	Disruption of streambank vegetation is very high; vegetation has been removed to ≤ 2 inches average stubble height.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
12 **Riparian vegetative zone (each bank)**	Width of riparian zone >60 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 60 - 40 feet; human activities have impacted zone only minimally.	Width of riparian zone 40 - 20 feet; human activities have impacted zone a great deal.	Width of riparian zone <20 feet; little or no riparian vegetation due to human activities.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0

ADEM-FIELD OPERATIONS-MONTGOMERY BRANCH
GLIDE/POOL HABITAT ASSESSMENT FIELD DATA SHEET

Name of Waterbody _____ Date: _____
Station Number _____ Investigators _____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1 **Instream Cover**	> 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present.	50-30% mix of stable habitat; adequate habitat for maintenance of populations.	30-10% mix of stable habitat; habitat availability less than desirable.	<10% stable habitat; lack of habitat is obvious.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2 **Pool Substrate Characterization**	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3 **Pool Variability**	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4 **Man-made Channel Alteration**	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent.	New embankments present on both banks; channelization may be extensive, usually in urban or agriculture lands; and > 80% of stream reach is channelized and disrupted.	Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5 **Sediment Deposition**	<20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars.	20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation.	50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events.	Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to deposition.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6 **Channel Sinuosity**	Bends in stream increase stream length 3 to 4 times longer than if it was in a straight line.	Bends in stream increase stream length 2 to 3 times longer than if it was in a straight line.	Bends in stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7 **Channel flow Status**	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8 **Condition of Banks**	Banks stable; no evidence of erosion or bank failure; <5% affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% affected.	Moderately unstable; 30-60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent along straight section and bends; on side slopes, 60-100% of bank has erosional scars.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
9 **Bank Vegetative Protection (each bank)**	> 90% of the streambank surfaces covered by vegetation.	90-70% of the streambank surfaces covered by vegetation.	70-50% of the streambank surfaces covered by vegetation.	<50% of the streambank surfaces covered by vegetation.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
10 **Grazing or other disruptive pressure (each bank)**	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; >1/2 of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; <1/2 of the potential plant stubble height remaining.	Disruption of streambank vegetation is very high; vegetation has been removed to ≤ 2 inches average stubble height.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
11 **Riparian vegetative zone Width (each bank)**	Width of riparian zone >60 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 60 - 40 feet; human activities have impacted zone only minimally.	Width of riparian zone 40 - 20 feet; human activities have impacted zone a great deal.	Width of riparian zone <20 feet; little or no riparian vegetation due to human activities.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0

SHU Name:		SHU #:	**Visible Threats (check as many as applicable)**
Crossing ID: (FIPS# - Crossing #) ___ ___ ___ ___ ___ - ___ ___ ___ ___ ___			Livestock access ☐
Date:	Time: Start	End	Eroding banks ☐
Location:	Upland=1	Lowland=2	Fish barriers ☐
Surveyor(s):			Road material in stream ☐
State: County:	New Crossing? ☐		ATV access ☐
Latitude (DD):	Owner of GPS, camera:		No riparian cover ☐
Longitude(DD):	Note taker:		**Others:**
Road Type: Paved Unpaved	**Public Private**	**Qualitative Sed Risk Level (circle one): LOW MODERATE HIGH Don't Know**	
Full Survey Performed? Yes No If No, why not?			**Restoration**
Other Comments:			Project Possibility (circle one): Yes No Maybe

Stream Crossing Assessment				
WATERWAY	**5**	**3**	**1**	**Score**
1. Upstream channel morphology	A B C E Wetland	DA Beaver dam	D F G Ponded	
2. Downstream channel morphology	A B C E Wetland	DA Beaver dam	D F G Ponded	
3. Downstream channel/bank alteration	Natural	Minor or Partial	High	
CROSSING STRUCTURE	**Crossing type**: Culvert Bridge Ford		**Number of culverts:**	
Culvert type: Round Pipe elliptical Open arch Box Trough box Open box Other:				
Structure materials: Metal (corrugated) PVC Synthetic Reinforced concrete Wood Native soil Clay Rock Other:				
Dimensions: Length/Span (ft): Diameter/Width (ft): Culvert outfall drop (ft):				
	5	**3**	**1**	**Score**
4. Upstream culvert skew angle (worst):	< 5º	5º to 30º	> 30º	
5. Crossing fill condition (dominant)	Good Vegetated	Fair Riprap	Poor Bare soil	
6. Crossing inlet/outlet condition:	No impairment	Sediment islands Scouring	Blocked	
Comments:				

ROAD APPROACHES I	**Right = right road approach when facing downstream**
Dimensions (right): Length (mi): Width (ft): Road prism fill (in): Slope (%):	
Potential eroded volume (right): Length x Width x Road prism fill x 16.3 = c.y.	
Dimensions (left): Length (mi): Width (ft): Road prism fill (in): Slope (%):	
Potential eroded volume (left): Length x Width x Road prism fill x 16.3 = c.y.	

	5		**3**		**1**		**Score**
	Upland	Lowland	Upland	Lowland	Upland	Lowland	
7. Potential eroded volume (mean)	< 15 c. y.	< 21 c.y.	15-30 c.y.	21-40 c.y.	> 30 c.y.	> 40 c.y.	
8. Soil type: K-factor:	≤ .15	≤ 0.20	0.16-0.30	0.21-0.40	> .30	> 0.40	
9. Road approach slope (mean %)	≤ 1.5 %	≤ 2.0 %	1.6-3.0 %	2.1-4.0 %	> 3.0%	> 4.0 %	
10. Road approach surface material	All Aggregate or 1 APR: Aggreate 1 APR: Sand/Clay		All Sand/Clay or 1 APR: Aggregate 1 APR: Native Soil		All Native Soil or 1 APR: Native Soil 1 APR: Sand/Clay		

NOTES

Use English units only

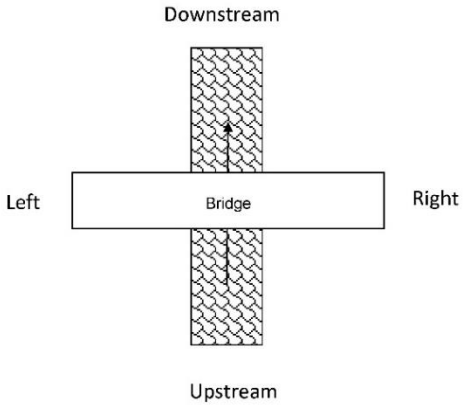
Slope calculation									
Right (%)	Left (%)								
1._____	1._____								
2._____	2._____								
3._____	3._____								
4._____	4._____								
5._____	5._____								
Avg. _____	Avg. _____								

PHOTOS		
	1	Upstream channel from crossing
	2	Downstream channel from crossing
	3	Right road approach from crossing
	4	Left road approach from crossing
	5	Crossing structure from upstream
	6	Crossing structure from downstream
	7	Right road approach from 150 ft
	8	Left road approach from 150 ft

ROAD APPROACHES II	**Right = right road approach when facing downstream**								
DOWNSTREAM									
Left outlet	Vegetated	Riprap	Synthetic	+1	**Left ditch**	Vegetated	Riprap	Synthetic	+1
(pick one):	Bare soil	Concrete	Other:	+0	**(pick one):**	Bare soil	Concrete	Other:	+0
Right outlet	Vegetated	Riprap	Synthetic	+1	**Right ditch**	Vegetated	Riprap	Synthetic	+1
(pick one):	Bare soil	Concrete	Other:	+0	**(pick one):**	Bare soil	Concrete	Other:	+0
UPSTREAM									
Left outlet	Vegetated	Riprap	Synthetic	+1	**Left ditch**	Vegetated	Riprap	Synthetic	+1
(pick one):	Bare soil	Concrete	Other:	+0	**(pick one):**	Bare soil	Concrete	Other:	+0
Right outlet	Vegetated	Riprap	Synthetic	+1	**Right ditch**	Vegetated	Riprap	Synthetic	+1
(pick one):	Bare soil	Concrete	Other:	+0	**(pick one):**	Bare soil	Concrete	Other:	+0
		SUM:					**SUM:**		
		If SUM = 4,2, or 0, then add		+1			If SUM = 4,2, or 0, then add		+1
		If SUM = 1, then add		+2			If SUM = 1, then add		+2
		If SUM = 3, then add		+0			If SUM = 3, then add		+0
		11. Outlet TOTAL					**12. Ditch TOTAL**		

SEDIMENTATION RISK INDEX (SRI)				**TOTAL SRI SCORE:**
Narrative risk rank:	**Low risk**	**Moderate risk**	**High risk**	
SRI score:	**46 - 60**	**37 - 45**	**12 - 36**	

NOTES



Use English units only

APPENDIX E

SEDIMENTATION RISK INDEX (SRI) EVALUATIONS PERFORMED
IN BIG CANOE CREEK WATERSHED

Abbreviations:

Road surface—Paved, P, Unpaved, U

Sediment Risk Level—High, H; Moderate, M; Low, L

Trib.—smaller, unnamed tributary of a larger stream network. Many of these tributaries are dry most of the year and serve as stormwater conduits.

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
U	Ford at private Dr. off of Canoe Cr. Rd.	361212111532	33.7891	-86.5214	22	H
P	Trib. to Big Canoe Cr. at Cedar Mountain Rd.	361212131221	33.7343	-86.5696	30	H
P	Trib. to Jake Cr. at Smith Dr./Mount Lebenon Rd.	361302061069	33.9552	-86.2461	30	H
P	Trib. to Little Canoe Cr. at Shanghi Rd.	361212121548	33.7522	-86.4014	32	H
P	Trib. to Big Canoe Cr. at Clayton Cove Rd.	361212131511	33.7533	-86.5447	32	H
P	Trib. to Big Canoe Cr. at Ryans Ln.	361302041103	33.8972	-86.3194	32	H
P	Trib. to Jake Cr. at Hartline Rd.	361302061079	33.9432	-86.2518	32	H
P	Trib. to Early Cr. at Early Springs Rd.	361302051287	33.8685	-86.3243	34	H
P	Trib. to Big Canoe Cr. at Double Bridge Rd.	361302051353	33.8987	-86.2502	34	H
P	Trib. to Gulf Cr. at St. Clair Co. Hwy. 42	361302061049	33.9441	-86.2601	34	H
P	Trib. to Big Canoe Cr. at Crawford's Cove Rd.	361212111355	33.8449	-86.3795	36	H
P	Trib. to Muckelroy Cr. at Curt Hinton Rd.	361302051377	33.9092	-86.3124	36	H
P	Trib. to Jake Cr. at Steele Gap Rd.	361302071132	33.9402	-86.2524	36	H
P	Trib. to Big Canoe Cr. at Prophecy Ln.	361303131567	33.8216	-86.4535	36	H
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031088	33.9311	-86.1970	36	H
U	Riley Bridge at APCO property	361302061562	33.7750	-86.3895	38	M
U	Trib. to Big Canoe Cr. at Colley Rd.	361302061336	33.8284	-86.2667	40	M
U	Trib. to Big Canoe Cr. at APCO property	361303131153	33.7968	-86.4339	45	M
P	Trib. to Jake Cr. at Hartline Rd.	361302061101	33.9459	-86.2479	38	M
P	Trib. to Jake Cr. at Mount Lebanon Rd.	361302061285	33.9544	-86.2226	40	M
P	Trib. at U.S. Hwy. 11	361302061379	33.8340	-86.3596	40	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061022	33.8871	-86.1673	42	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302061151	33.8884	-86.2698	42	M
P	Early Cr. at Crawford Cove Rd.	361302061220	33.8681	-86.3517	42	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061343	33.8595	-86.2275	42	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061395	33.8875	-86.1567	42	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061012	33.8613	-86.2242	44	M
P	Trib. to Jake Cr. at Mount Lebanon Rd./Bynum Rd.	361302061284	33.9543	-86.2227	44	M
P	Trib. to Gulf Cr. Jake Cr. Rd.	361302061490	33.9516	-86.2547	44	M
P	Trib. to Jake Cr. at Chandler Mountain Rd.	361302061505	33.9688	-86.2245	44	M
P	Trib. to Big Canoe Cr. at McElroy Rd.	361302051352	33.8955	-86.2550	38	M
P	Trib. to Walker Branch at Crawford Cove Rd.	361303121572	33.8442	-86.3813	38	M
P	Crooked Cr. at Sportsman Lake Spillway	361212121025	33.7202	-86.4142	38	M
P	Trib. to Big Canoe Cr. at Settlement Rd.	361212131512	33.7541	-86.5450	38	M
P	Trib. to Big Canoe Cr. at Shore Dr. (spillway)	361302041420	33.8366	-86.3073	38	M
P	Trib. to Locust Branch at Murray Circle	361302061149	33.8541	-86.2704	38	M
P	Trib. to Big Canoe Cr. at 6th Avenue	361302061167	33.8354	-86.2586	38	M
P	Trib. to Pinedale Lake at I-59 South Bound Ln.	361302061202	33.8340	-86.3312	38	M
P	Trib. to Big Canoe Cr. at St. Clair Co. Hwy. 31	361212111306	33.8214	-86.3923	40	M
P	Big Canoe Cr. at Cedar Mountain Rd.	361212131068	33.7507	-86.5839	40	M
P	Trib. to Big Canoe Cr. at Pine Mountain Circle	361212141058	33.8033	-86.5 641	40	M

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	South Fork Cr. at Oaks Rd.	361212141538	33.7777	-86.3231	40	M
P	Trib. to Big Canoe Cr. at Beason Cove Rd.	361302051020	33.9041	-86.2740	40	M
P	Early Cr. at Huff Ln.	361302051363	33.8720	-86.3242	40	M
P	Trib. to Locust Branch at U.S. Hwy. 231	361302061138	33.8585	-86.2843	40	M
P	Trib. to Walker Branch at Walker Gap Rd.	361303121356	33.8488	-86.3815	40	M
P	Trib. to Little Canoe Cr. at I-59 (Southbound Ln.)	361303201071	33.7592	-86.4764	40	M
P	Trib. to Hickman Lake at Cross Street	361303211042	33.7800	-86.4664	40	M
P	Trib. to Big Canoe Cr. at Cross Street	361304161039	33.7813	-86.4658	40	M
P	Trib. to Big Canoe Cr. at St. Clair Co. Hwy. 31	361212111170	33.8191	-86.3802	42	M
P	Trib. to Little Canoe at U.S. Hwy. 11	361212121267	33.7483	-86.4938	42	M
P	Trib. to Crooked Cr. at Sportsman Lake Rd.	361212121405	33.7169	-86.4338	42	M
P	Trib. to Little Canoe Cr. at St. Clair Co. Correctional Rd.	361212131081	33.7471	-86.3886	42	M
P	Little Canoe Cr. at St. Clair Co. Correctional Rd.	361212131218	33.7569	-86.3900	42	M
P	Trib. to Big Canoe Cr. at Ala. Hwy. 23	361302051030	33.8019	-86.3118	42	M
P	Trib. to Big Canoe Cr. at Doss Ln.	361302051104	33.8298	-86.2942	42	M
P	Trib. to Logan Branch at Aubra Dr.	361302051135	33.9086	-86.2617	42	M
P	Trib. to Big Canoe Cr. at Wood Street	361302051331	33.9376	-86.1897	42	M
P	Trib. to Muckelroy Cr. at Beacon Cove Rd.	361302051332	33.8971	-86.2932	42	M
P	Dry Cr. to Big Canoe Cr. at Ala. Hwy. 23	361302051385	33.8053	-86.3034	42	M
P	Big Canoe Cr. at U.S. Hwy. 231	361302061156	33.8401	-86.2626	42	M
P	Trib. to Big Canoe Cr. at St. Clair Co. Hwy. 232	361302061510	33.8375	-86.2575	42	M
P	Locust Branch at Double Bridge Rd.	361302071165	33.8504	-86.2535	42	M
P	Trib. to Big Canoe Cr. at Double Bridge Rd.	361302071492	33.8714	-86.2509	42	M
P	Trib. to Hickman Lake at Ala. Hwy. 174	361303141360	33.7695	-86.4699	42	M
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304031087	33.9310	-86.1976	42	M
P	Trib. to Little Canoe Cr. at Cross Street	361212111060	33.7769	-86.4634	44	M
P	Trib. to Big Canoe Cr. at St. Clair Co. Hwy. 31	361212111307	33.8138	-86.4118	44	M
P	Walker Branch at St. Clair Co. Hwy. 31	361212111427	33.8198	-86.3804	44	M
P	Crooked Cr. at Sportsman Lake Rd.	361212121408	33.7117	-86.4125	44	M
P	Spring run in downtown Springville at U.S. Hwy. 11	361212121544	33.7746	-86.4727	44	M
P	Trib. at Mack Hicks Rd.	361212131241	33.7306	-86.5732	44	M
P	Trib. to Big Canoe Cr. at Tyler Rd.	361212141241	33.7806	-86.5981	44	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302051021	33.9366	-86.2044	44	M
P	Trib. to Big Canoe Cr. at Beason Cove Rd.	361302051052	33.9140	-86.2597	44	M
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302051216	33.8860	-86.2771	44	M
P	Trib. to Muckelroy Cr. at Curt Hinton Rd.	361302051232	33.8973	-86.3074	44	M
P	Trib. to Muckelroy Cr. at Beacon Cove Rd.	361302051302	33.8971	-86.2939	44	M
P	Trib. to Muckelroy Cr. at Sweatt Rd.	361302051342	33.8647	-86.3019	44	M
P	Muckelroy Cr. at Beacon Cove Rd.	361302051364	33.8917	-86.3077	44	M
P	Trib. to Big Canoe Cr. at Chandler Mountain Rd.	361302051504	33.9319	-86.2170	44	M
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302051555	33.7821	-86.4076	44	M

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Locust Branch at Fant Dr.	361302061150	33.8533	-86.2687	44	M
P	Trib. to Big Canoe Cr. at I-59 North Bound Ln.	361302061274	33.7993	-86.3739	44	M
P	Trib. to Big Canoe Cr. at St. Clair Co. Hwy. 25	361303121028	33.8196	-86.4044	44	M
P	Trib. to Big Canoe Cr. at Sullivan Ln.	361303131413	33.8204	-86.4614	44	M
P	Trib. to Pinedale Lake at I-59 (Northbound Ln.)	361303211262	33.8464	-86.3163	44	M
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031002	33.9130	-86.2197	44	M
P	Trib. to Big Canoe creek at I-59 rest area	361304161467	33.8723	-86.2729	44	M
P	Trib. to Big Canoe Cr. at Brogden Rd.	361304161574	33.9343	-86.1995	44	M
P	Trib. to Pinedale Lake at I-59 (Southbound Ln.)	361303211263	33.8468	-86.3167	44	M
U	Trib. to Big Canoe Cr. at a private Dr.	361303121445	33.8249	-86.3977	46	L
U	Trib. to Big Canoe Cr. at Tidwel Circle	361212111326	33.8050	-86.5271	48	L
U	Trib. to Big Canoe Cr. at Canoe Lake Dr.	361212121154	33.7939	-86.4887	48	L
U	Crooked Cr. at Mountain Cr. Rd.	361212121547	33.7299	-86.4139	48	L
U	Site #13 on Riley Farms at APCO property	361302061561	33.7803	-86.3767	50	L
U	Trib. to Big Canoe Cr. at APCO property	361303131571	33.7951	-86.4323	50	L
U	Trib. to Crooked Cr. at Caldwell Rd.	361212121489	33.7243	-86.4143	52	L
U	Stovall Branch downstream of Ala. Hwy. 174	361212131546	33.7051	-86.4031	52	L
U	Trib. to Big Canoe Cr. at Sawmill Cove Trail	361212141116	33.8071	-86.5813	52	L
U	Trib. to Little Canoe Cr. at Wayne Tucker Private Dr.	361212101255	33.7345	-86.3844	54	L
U	Trib. to Big Canoe Cr. at APCO property	361303131050	33.7976	-86.4344	54	L
U	Big Canoe Cr. at APCO property	361303131569	33.8019	-86.4383	54	L
U	Little Canoe Cr. at Springville Water Treatment Facility Rd.	361212131540	33.7674	-86.4553	58	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061338	33.8662	-86.2151	46	L
P	Trib. to Big Canoe Cr. at Beason Cove Rd.	361302051082	33.9012	-86.2800	46	L
P	Trib. to Big Canoe Cr. at John Ramsey Rd.	361302051472	33.7915	-86.3292	46	L
P	Trib. to Beulah Church Rd.	361210301551	33.7834	-86.3631	46	L
P	Big Canoe Cr. at U.S. Hwy. 11	361212111219	33.8141	-86.3820	46	L
P	Trib. to Little Canoe at Weems Rd.- Will Keith Rd.	361212121545	33.7177	-86.5162	46	L
P	Trib. to Big Canoe Cr. at Cedar Mountain Rd.	361212131179	33.7446	-86.5795	46	L
P	Trib. to Little Canoe Cr. at Evergreen Rd.	361212131431	33.7565	-86.3540	46	L
P	Trib. to Big Canoe Cr. at Mize Rd.	361212141053	33.7878	-86.5778	46	L
P	Trib. to Big Canoe Cr. at Homestead Ln.	361212141537	33.7846	-86.5952	46	L
P	Trib. to Big Canoe Cr. at Shore Dr.	361302041264	33.8467	-86.3148	46	L
P	Trib. to Big Canoe Cr. at Williams Ln.	361302041294	33.8277	-86.3332	46	L
P	Trib. to Big Canoe Cr. at Gallant Rd.	361302041448	33.9604	-86.3151	46	L
P	Trib. to Big Canoe Cr. at Shore Dr.	361302041462	33.8321	-86.3240	46	L
P	Trib. to Big Canoe Cr. at thru Rd. between St. Clair Co. Hwy. 31 and John Ramsey Rd.	361302051471	33.7924	-86.3296	46	L
P	Trib. to Muckelroy Cr. at Beacon Cove Rd.	361302051491	33.8928	-86.3014	46	L
P	Trib. to Big Canoe Cr. at Bucks Valley	361302051522	33.7685	-86.3322	46	L

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Pinedale Lake at I-59 North Bound Ln.	361302061200	33.8336	-86.3308	46	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302061201	33.8471	-86.3481	46	L
P	Trib. to Pinedale Lake at I-59 North Bound Ln.	361302061292	33.8283	-86.3372	46	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302071023	33.8463	-86.2404	46	L
P	Trib. to Big Canoe Cr. at Turner Dr.	361302071024	33.8459	-86.2404	46	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302071243	33.8563	-86.2323	46	L
P	Trib. to Gulf Cr. at Loop Rd.	361302071256	33.9353	-86.2737	46	L
P	Trib. to Big Canoe Cr. at Carriage Dr.	361302071450	33.8515	-86.2296	46	L
P	Trib. to Pinedale Lake at I-59 (Northbound Ln.)	361303211139	33.8496	-86.3120	46	L
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304161481	33.8744	-86.2692	46	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061108	33.8698	-86.2050	48	L
P	Trib. at U.S. Hwy. 11	361302061136	33.8213	-86.3720	48	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061276	33.8825	-86.1822	48	L
P	Locust Branch to Big Canoe Cr. at I-59	361304031396	33.8645	-86.2847	48	L
P	Gin Branch at Beulah Church Rd. (1)	361210301316	33.7812	-86.3630	48	L
P	Trib. to Little Canoe Cr. at Old Springs Rd.	361212111080	33.7772	-86.4495	48	L
P	Trib. to Big Canoe Cr. on Canoe Cr. Rd.	361212111172	33.7983	-86.5123	48	L
P	Trib. to Big Canoe Cr. at Pine Mountain Rd.	361212111327	33.1807	-86.5245	48	L
P	Trib. to Little Canoe Cr. at Springville H. School	361212111550	33.7830	-86.4396	48	L
P	Trib. to Big Canoe Cr. at Bradford Rd.	361212121017	33.7836	-86.4846	48	L
P	Trib. to Big Canoe Cr. at Murphress Valley Rd.	361212121155	33.7933	-86.4886	48	L
P	Little Canoe Cr. at Shanghi Rd.	361212121258	33.7575	-86.4022	48	L
P	Trib. to Little Canoe Cr. at Bucks Valley Rd.	361212131029	33.7605	-86.3521	48	L
P	Trib. to Little Canoe Cr. at Mosley Rd.	361212131247	33.7638	-86.3434	48	L
P	Trib. to Big Canoe Cr. at Clayton Rd.	361212131337	33.7376	-86.5617	48	L
P	South Fork at Ray Wyatt Rd.	361212141055	33.7849	-86.3074	48	L
P	Trib. to Big Canoe Cr. at Mize Rd.	361212141350	33.7804	-86.5811	48	L
P	Trib. to Fall Branch on Pine Mountain Rd.	361212141368	33.8058	-86.5756	48	L
P	Trib. to Big Canoe Cr. at Fall Branch Rd.	361212141496	33.7967	-86.5737	48	L
P	Trib. to Big Canoe Cr. at Gallant Rd.	361302041212	33.9251	-86.3162	48	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302041391	33.7276	-86.4990	48	L
P	Trib. to Big Canoe Cr. at Williams Ln.	361302041560	33.8275	-86.3332	48	L
P	Trib. to Big Canoe Cr. at St. Clair Co. Rd. 33	361302051008	33.7736	-86.3287	48	L
P	Big Canoe Cr. at St. Clair Co. Hwy. 36	361302051043	33.8328	-86.2834	48	L
P	Trib. to Big Canoe Cr. at Ala. Hwy. 23	361302051142	33.8016	-86.3146	48	L
P	Trib. to Little Canoe Cr. at I-59	361302051159	33.7790	-86.4205	48	L
P	Trib. to Muckelroy Cr. at Curt Hinton Rd.	361302051183	33.9043	-86.3080	48	L
P	Trib. to Big Canoe Cr. at Beason Cove Rd.	361302051253	33.9064	-86.2707	48	L
P	Trib. to Big Canoe Cr. at Steele Station Rd.	361302051269	33.9354	-86.1984	48	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln. (Exit 156)	361302051295	33.7764	-86.4300	48	L

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Logan Branch at Aubra Dr.	361302051299	33.9070	-86.2607	48	L
P	Trib. to Big Canoe Cr. at Chandler Mountain Rd.	361302051493	33.9299	-86.2199	48	L
P	Trib. to Big Canoe Cr. at 5th Street	361302061168	33.8319	-86.2555	48	L
P	Trib. to Big Canoe Cr. at I-59 South Bound Ln.	361302061205	33.8138	-86.3541	48	L
P	Trib. to Big Canoe Cr. at 6th Avenue	361302061334	33.8309	-86.2665	48	L
P	Trib. to Big Canoe Cr. at Mississippi Dr.	361302071344	33.8547	-86.2270	48	L
P	Trib. to Little Canoe Cr. at I-59 (Southbound Ln.)	361303201272	33.7858	-86.3972	48	L
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304161001	33.9121	-86.2194	48	L
P	Trib. at U.S. Hwy. 11	361302061075	33.8514	-86.3438	50	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302061093	33.8876	-86.1540	50	L
P	Trib. to Big Canoe Cr. on U.S. Hwy. 411	361302061119	33.8738	-86.1966	50	L
P	Trib. at U.S. Hwy. 11 and Bartram Circle	361302061244	33.8337	-86.3601	50	L
P	Early Cr. at Crawford Cove Rd.	361302061367	33.8673	-86.3529	50	L
P	Trib. to Big Canoe Cr. at St. Clair Co. Rd. 23	361302061411	33.8247	-86.2778	50	L
P	Trib. to Big Canoe Cr. at Spring HolL Rd.	361302061412	33.8245	-86.2770	50	L
P	Trib. to Big Canoe Cr. at U.S. Hwy 411	361302061421	33.8868	-86.1438	50	L
P	Trib. to Big Canoe Cr. at Loop Rd.	361302061528	33.8796	-86.1796	50	L
P	Trib. to Big Canoe Cr. at St. Clair Co.Rd. 31	361302051076	33.7719	-86.3290	50	L
P	Little Canoe Cr. at Beulah Church Rd.	361210301349	33.7800	-86.3625	50	L
P	Trib. to Little Canoe Cr. at U.S. Hwy. 11	361212111097	33.7818	-86.4305	50	L
P	Big Canoe Cr. at Big Canoe Cr. Rd.	361212111217	33.7935	-86.5173	50	L
P	Trib. to Big Canoe Cr. at Burgess Rd.	361212121018	33.7778	-86.4875	50	L
P	Trib. to Big Canoe Cr. at Heritage Valley Rd.	361212121078	33.7830	-86.5143	50	L
P	Trib. to Little Canoe Cr. west at Mountain View Rd.	361212121280	33.7466	-86.4866	50	L
P	Little Canoe Cr. at Mountain View Rd.	361212121437	33.7531	-86.4871	50	L
P	Trib. to Big Canoe Cr. at Zuber Rd.	361212131187	33.7559	-86.5597	50	L
P	Trib. to Little Canoe Cr. at Pearl Lake Rd.	361212131214	33.7464	-86.4184	50	L
P	Big Canoe Cr. at Cedar Mountain Rd.	361212131234	33.7467	-86.5690	50	L
P	Crooked Cr. at St. Clair Co. Hwy. 12	361212131407	33.7088	-86.4113	50	L
P	Trib. to Big Canoe Cr. at Tyler Rd.	361212141386	33.7716	-86.5934	50	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 231	361302041102	33.8949	-86.3142	50	L
P	Trib. to Big Canoe Cr. at Shore Dr.	361302041141	33.8489	-86.3118	50	L
P	Trib. to Big Canoe Cr. at Cherokee Rd.	361302041178	33.8378	-86.3217	50	L
P	Little Canoe Cr. at I-59 North Bound Ln. near RxR crossing	361302041398	33.7245	-86.5051	50	L
P	Trib. to Big Canoe Cr. at Hoyt Hill Rd.	361302051031	33.7906	-86.3119	50	L
P	Little Canoe Cr. at I-59 North Bound Ln.	361302051051	33.7596	-86.4744	50	L
P	Trib. to Big Canoe Cr. at St. Clair Co. Rd. 23	361302051083	33.7909	-86.3438	50	L
P	Trib. to Early Cr. at Crawford Cove Rd.	361302051157	33.8860	-86.3312	50	L
P	Trib. to Big Canoe Cr. at Chandler Mountain Rd.	361302051229	33.9295	-86.2260	50	L
P	Gulf Cr. at U.S. Hwy. 11	361302051252	33.9023	-86.2475	50	L

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Muckelroy Cr. at Curt Hinton Rd.	361302051286	33.8924	-86.3074	50	L
P	Trib. to Big Canoe Cr. at Steele Station Rd.	361302051330	33.9320	-86.1810	50	L
P	Muckelroy Cr. at U.S. Hwy. 11	361302051346	33.8745	-86.2997	50	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11 RxR bridge	361302051559	33.9366	-86.2044	50	L
P	Trib. to Big Canoe Cr. at I-59 North Bound Ln.	361302061013	33.8147	-86.3515	50	L
P	Trib. to Big Canoe Cr. at I-59 North Bound Ln.	361302061204	33.8133	-86.3535	50	L
P	Jake Cr. at St. Clair Co.Rd. 42	361302071011	33.9338	-86.2439	50	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 411	361302071128	33.8411	-86.2463	50	L
P	Trib. to Little Canoe Cr. at I-59 (Southbound Ln.)	361303201096	33.7853	-86.3992	50	L
P	Trib. to Pinedale Lake at I-59 (Southbound Ln.)	361303211140	33.8501	-86.3121	50	L
P	Gulf Cr. at I-59 (Southbound Ln.)	361304031283	33.8961	-86.2387	50	L
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031387	33.8740	-86.2678	50	L
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304161146	33.8775	-86.2648	50	L
P	Gulf Cr. at I-59 (Northbound Ln.)	361304161282	33.8952	-86.2384	50	L
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304161328	33.9360	-86.1895	50	L
P	Early Cr. at Crawford Cove Rd.	361302061315	33.8610	-86.3622	52	L
P	N. Fork Dry Cr. at St. Clair Co. Rd. 26	361302061373	33.8146	-86.2543	52	L
P	Trib. to Jake Cr. at Chandler Mountain Rd.	361302061498	33.9733	-86.2107	52	L
P	Trib. to Middle Canoe Cr. at Loop Rd.	361302061529	33.8759	-86.1796	52	L
P	Trib. to Little Canoe Cr. at U.S. Hwy. 11	361212111033	33.7883	-86.4165	52	L
P	Big Canoe Cr. at St. Clair Co. Hwy. 31	361212111281	33.8045	-86.4195	52	L
P	Trib. to Little Canoe Cr. at Ala. Hwy. 23	361212111297	33.7747	-86.4250	52	L
P	Trib. to Big Canoe Cr. on Canoe Cr. Rd.	361212111463	33.8024	-86.4961	52	L
P	Trib. to Little Canoe Cr. at Welch Dr.	361212111549	33.7708	-86.4282	52	L
P	Trib. to Little Canoe Cr. at Jones Rd.	361212121485	33.7709	-86.4286	52	L
P	Big Canoe Cr. at Deer Haven Rd.	361212131270	33.7550	-86.5795	52	L
P	Trib. to Big Canoe Cr. at Cedar Mountain Rd.	361212131536	33.7472	-86.5786	52	L
P	Trib. to Big Canoe Cr. at Mize Rd.	361212141067	33.7826	-86.5797	52	L
P	Fall Branch at Fall Branch Rd.	361212141237	33.7993	-86.5729	52	L
P	Trib. to Big Canoe Cr. at Mize Rd.	361212141324	33.7984	-86.5822	52	L
P	Big Canoe Cr. at St. Clair Co. Hwy. 31	361212141400	33.7965	-86.3331	52	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302041121	33.7482	-86.4842	52	L
P	Trib. to Big Canoe Cr. at Gallant Rd.	361302041325	33.9222	-86.3169	52	L
P	Early Cr. at Wentz Ln.	361302051056	33.8787	-86.3047	52	L
P	Trib. to Muckelroy Cr. at Curt Hinton Rd.	361302051114	33.9070	-86.3088	52	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 231	361302051228	33.7950	-86.2720	52	L
P	North Fork Dry Cr. to Big Canoe Cr. at U.S. Hwy. 231	361302051371	33.7999	-86.2722	52	L
P	Trib. to Big Canoe Cr. at Bucks Valley	361302051523	33.7689	-86.3370	52	L
P	Trib. to Big Canoe Cr. at I-59 South Bound Ln.	361302061014	33.8159	-86.3518	52	L
P	Trib. to Big Canoe Cr. at I-59 South Bound Ln.	361302061275	33.7997	-86.3745	52	L

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Gulf Cr. at Loop Rd.	361302071242	33.9373	-86.2622	52	L
P	Trib. to Middle Canoe Cr. at U.S.Hwy. 411	361302071254	33.8541	-86.2349	52	L
P	Little Canoe Cr. at I-59	361303201106	33.7558	-86.4793	52	L
P	Trib. to Big Canoe Cr. at Crump Rd.	361304031086	33.9307	-86.1966	52	L
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031145	33.8773	-86.2637	52	L
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304161319	33.8826	-86.2591	52	L
P	Gin Branch at Beulah Church Rd. (2)	361210301175	33.7839	-86.3721	54	L
P	Little Canoe Cr. at Prison Rd.	361212101203	33.7369	-86.3802	54	L
P	Trib. to Little Canoe Cr. at Ala. Hwy. 23	361212111105	33.7643	-86.4080	54	L
P	Trib. to Little Canoe Cr. at Mardis Rd.	361212111259	33.7576	-86.4044	54	L
P	Trib. to Big Canoe Cr. on Canoe Cr. Rd.	361212111301	33.7966	-86.5162	54	L
P	Trib. to Little Canoe Cr. at U.S. Hwy. 11	361212121062	33.7538	-86.4872	54	L
P	Trib. to Little Canoe Cr. at Ala. Hwy. 174	361212121125	33.7176	-86.4053	54	L
P	Trib. to Big Canoe Cr. at Oak Grove Rd.	361212121288	33.8085	-86.4613	54	L
P	Trib. to Big Canoe Cr. at Clayton Rd.	361212131186	33.7434	-86.5561	54	L
P	Trib. to Little Canoe Cr. at Ala. Hwy. 174	361212131213	33.7431	-86.4186	54	L
P	Trib. at Mize Rd.	361212131250	33.7671	-86.5871	54	L
P	Spring run at Cool Springs	361212141321	33.7969	-86.3292	54	L
P	Trib. to Big Canoe Cr. at Gallant Rd.	361302041000	33.9205	-86.3179	54	L
P	Trib. to Big Canoe Cr. at Brodgen Rd.	361302051161	33.9323	-86.1996	54	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302051181	33.9291	-86.2135	54	L
P	Trib. to Big Canoe Cr. at Ray Ln.	361302051231	33.8216	-86.3070	54	L
P	Trib. to Jake Cr. at Beason Cove Rd.	361302051384	33.9183	-86.2499	54	L
P	Muckelroy Cr. at U.S. Hwy. 231	361302051409	33.9098	-86.3409	54	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302051434	33.7547	-86.4792	54	L
P	Jake Cr. at Beason Cove Rd.	361302051465	33.9183	-86.2499	54	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302051553	33.7579	-86.4760	54	L
P	Trib. to Big Canoe Cr. at U.S. Hwy. 11	361302061305	33.8439	-86.3508	54	L
P	Trib. to Pinedale Lake at I-59 (Southbound Ln.)	361303211177	33.8409	-86.3234	54	L
P	Muckleroy Cr. at I-59 (Northbound Ln.)	361303211235	33.8592	-86.2932	54	L
P	Muckleroy Cr. at I-59 (Southbound Ln.)	361303211236	33.8588	-86.2943	54	L
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304161304	33.8720	-86.2722	54	L
P	Trib. to Big Canoe Cr. at I-59 (Southbound Ln.)	361304161329	33.9366	-86.1894	54	L
P	Trib. to Middle Canoe Cr. at U.S. Hwy. 411	361302061127	33.8874	-86.1953	56	L
P	Early Cr. at Crawford Cove Rd.	361302061194	33.8715	-86.3474	56	L
P	Trib. to Little Canoe Cr. at Ala. Hwy. 23	361212111403	33.7718	-86.4238	56	L
P	Big Canoe Cr. at Murphreees Rd.	361212121007	33.7992	-86.4885	56	L
P	Little Canoe Cr. at Ala. Hwy. 174	361212121197	33.7332	-86.4102	56	L
P	Trib. to Little Canoe Cr. at U.S. Hwy. 11	361212121543	33.7556	-86.4865	56	L
P	Trib. to Big Canoe Cr. at Deer Haven Rd.	361212131072	33.7548	-86.5876	56	L
P	Trib. to Little Canoe Cr. at Evergreen Rd.	361212131345	33.7623	-86.3672	56	L

Road Surface	Location	SHU code	Latitude	Longitude	SRI Score	Risk Level
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302041095	33.7901	-86.3864	56	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302041552	33.7922	-86.3833	56	L
P	Trib. to Little Canoe Cr. at I-59 North Bound Ln.	361302051032	33.7800	-86.4162	56	L
P	Trib. to Little Canoe Cr. at I-59 South Bound Ln.	361302051034	33.7824	-86.4094	56	L
P	Trib. to Big Canoe Cr. at Beason Cove Rd.	361302051133	33.9088	-86.2676	56	L
P	Trib. to Little Canoe Cr. at Etowah Co. Hwy. 1	361302051189	33.9996	-86.2648	56	L
P	Gulf Cr. at Loop Rd.	361302071074	33.9273	-86.2747	56	L
P	Trib. to Jake Cr. at Chandler Mountain Rd.	361302071131	33.9399	-86.2543	56	L
P	Trib. to Gulf Cr. at Loop Rd.	361302071452	33.9261	-86.2735	56	L
P	Trib. to Gulf Cr. at Loop Rd.	361302071556	33.9365	-86.2657	56	L
P	Trib. to Pinedale Lake at I-59 (Northbound Ln.)	361303211176	33.8401	-86.3237	56	L
P	Trib. to Muckleroy Cr. at I-59 (Southbound Ln.)	361303211196	33.8551	-86.3019	56	L
P	Locust Branch to Big Canoe Cr. at I-59 (Northbound Ln.)	361304031303	33.8712	-86.2712	56	L
P	Trib. to Big Canoe Cr. at I-59 (Northbound Ln.)	361304161318	33.8816	-86.2586	56	L
P	Trib. to Little Canoe Cr. at U.S. Hwy. 11	361212111238	33.7806	-86.4502	58	L
P	Little Canoe Cr. at U.S. Hwy. 11	361212121003	33.7369	-86.5019	58	L
P	Little Canoe Cr. at Ala. Hwy. 23	361212131064	33.7674	-86.3739	58	L
P	Little Canoe Cr. at Legacy Springs Dr.	361212131542	33.7640	-86.4523	58	L
P	Trib. to Little Canoe Cr. at Jones Circle	361212111240	33.7810	-86.4511	60	L

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